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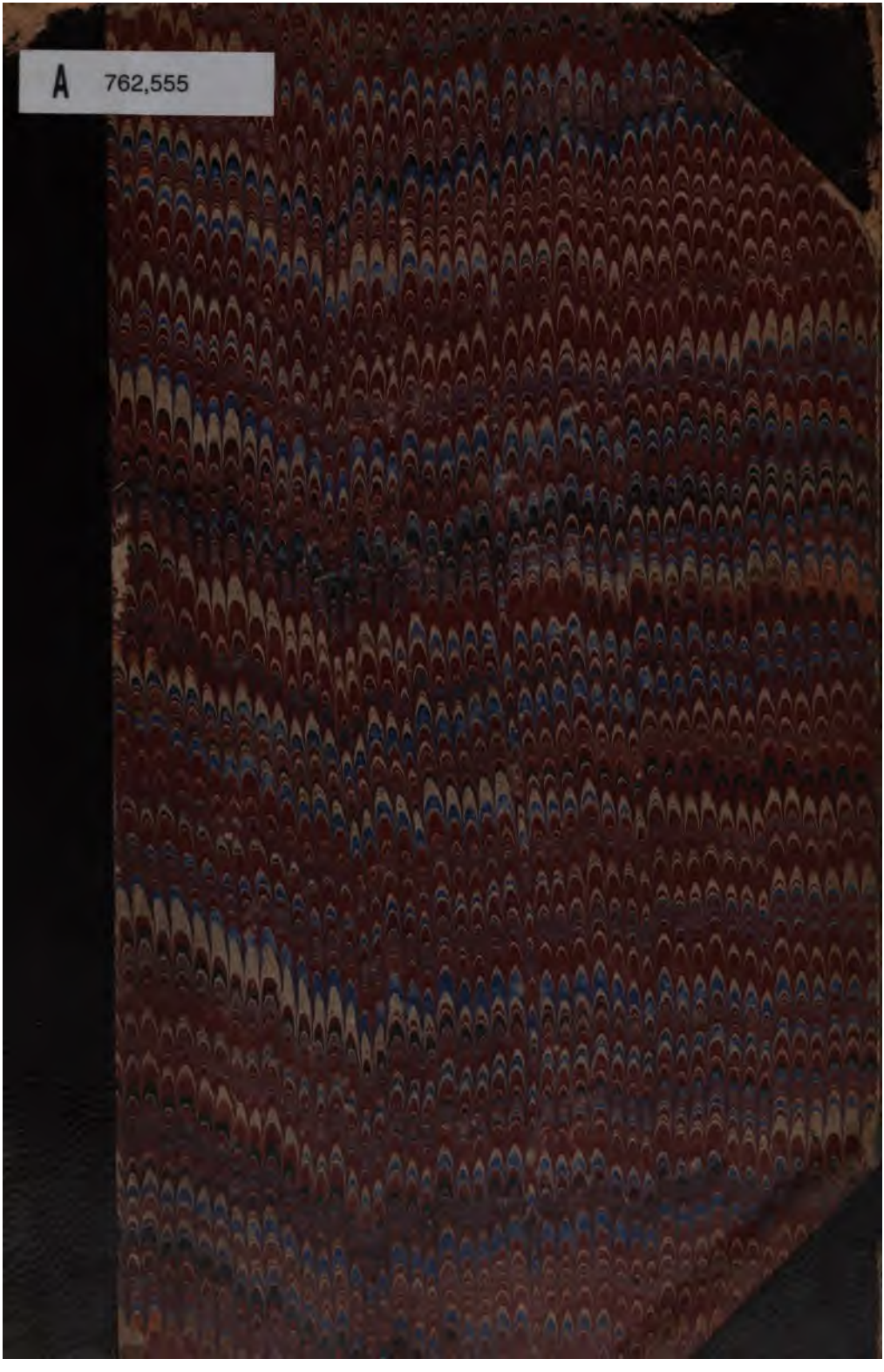

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THE

THIRTEENTH ANNUAL REPORT

OF THE

AMERICAN RAILWAY

MASTER MECHANICS' ASSOCIATION

IN CONVENTION AT CLEVELAND, O.,

MAY 11TH, 12TH, AND 13TH, 1880.

CINCINNATI:
WILSTACH, BALDWIN & CO.,
RAILWAY PRINTERS AND MANUFACTURING STATIONERS.
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AMERICAN RAILWAY

MASTER MECHANICS' ASSOCIATION.

OFFICERS FOR 1880.

PRESIDENT.

N. E. CHAPMAN, of Cleveland, Ohio.

FIRST VICE-PRESIDENT.

REUBEN WELLS, of Louisville, Ky.

SECOND VICE-PRESIDENT.

J. N. LAUDER, of Concord, N. H.

TREASURER.

S. J. HAYES, of Chicago, Ill.

SECRETARY.

J. H. SETCHEL, of Cincinnati, Ohio.

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REPORT.

The Thirteenth Annual Convention of the American Railway Master Mechanics' Association assembled, at the Board of Trade Room, in the city of Cleveland, May 11, 1880.

N. E. CHAPMAN, Master Mechanic of the Cleveland & Pittsburgh Railroad, in the Chair, and the following officers present:

J. N. LAUDER, Northern Railroad of New Hampshire, Second Vice-President.

S. J. HAYES, Illinois Central Railroad, Treasurer.

J. H. SETCHEL, Little Miami Railroad, Secretary.

The proceedings were opened with prayer, by the Rev. C. S. Pomeroy, of Cleveland, after which Hon. Mayor Herrick was introduced by President Chapman, and delivered the following

ADDRESS.

MR PRESIDENT AND GENTLEMEN:

You have met here to-day, in the birth-place of your Association, to make the annual exchange of information upon the many important questions connected with your occupation, and it is my pleasant duty to receive you in behalf of our citizens, and welcome you to the city of your nativity. We are always pleased to receive in our midst, and render what encouragement we may to, gentlemen so closely and importantly identified with that interest which, above all others, causes our cities to grow, our people to thrive, and our nation to become great and prosperous.

As you are here assembled, many of you will doubtless cast a retrospective glance over the twelve years that have elapsed since your organization, and will recall reminiscences of the past and mark the progress which you have made during this time. I trust you will find much cause for satisfaction in the progress already made.

Although not a member of your organization, yet I have a fraternal feeling toward you—being a mechanic myself. Your profession is

one of dignity and importance, for it is intimately related with the highest concerns of life. To you the world looks for progress in the advancement of the commercial affairs of men. The satisfaction of having developed and given to mankind some new improvement, or to have assisted, by interchange of thought or appliance, in utilizing any of the many discoveries of the age, is more satisfaction to one's self, and the honor more lasting, than all the glory surrounding political life—to say nothing of the benefits conferred upon the race. In your especial sphere you are both discoverers and utilizers of the mechanical laws and forces of nature. The problem of the age seems to be the discovery of the laws of nature and their application to the interest and welfare of man. Among all civilized nations we find the same spirit of inquiry and investigation; and the motive which actuates it is the betterment of mankind. We find the physician trying to unravel the deep mysteries of the human organization, in order to be able to readjust and repair any portion of its intricate machinery which may, through accident or otherwise, become disarranged; the chemist endeavors to analyze the substances of nature, and turn them to account in advancing the condition of man. The marvelous development in all the fields of scientific investigation—especially during the past half century—has made necessary the subdivision of the subjects of inquiry and distinct classification. No man or class of men can now take any single subject of scientific investigation and pursue it even as far as the appliances of the present time will permit. The field is too broad, and life too short, to entirely encompass all that is to be known. You are interested in but a small subdivision of that field of investigation which was opened up by the discovery and general application of steam; and yet, without doubt, you find your particular sphere large enough, broad enough, and deep enough to detain you and your successors in active, conscientious inquiry for some time to come, before it will be exhausted. The results of your particular labors, study, and scientific research lead to two ends: 1st. To building up the railroad interests with which you are immediately identified. 2d. To the security and welfare of the general public. Upon your department of the railroad service more depends than upon any other for the security and expedition in transit which is now not only expected but required; and hence it is necessary

that nothing should be left undone by you, and no source of information left unexplored which will bring about the desired results. In conclusion, permit me to express the hope that you will profit in rich measure by your deliberations, and that you will have no cause to regret having chosen Cleveland as the place for holding the Thirteenth Annual Meeting of your Association.

THE PRESIDENT—Gentlemen, the minutes of our last annual meeting have been printed in pamphlet form, and each member supplied with a copy of the same. It has been our custom to accept these minutes without reading. What is your pleasure in regard to it?

H. ANDERSON, of Chicago—I move the minutes be accepted without reading.

Motion carried.

THE PRESIDENT—The next business in order is the calling of the roll. The Secretary will please proceed with the call.

The Secretary then called the roll and the following members answered to their names:

LIST OF MEMBERS PRESENT.

NAME.	ROAD.	ADDRESS.
ANDERSON, H.		Chicago, Illinois.
BOON, J. M.	Pittsburgh, Fort Wayne & Chicago.	Fort Wayne, Indiana.
BUSHNELL, R. W.	Burlington, Cedar Rapids & Northern.	Cedar Rapids, Iowa.
BROOKS H. G.	Brooks Locomotive Works.	Dunkirk, New York.
BARNETT J. DAVIS.	Grand Trunk	Montreal, Canada.
BLACK, JOHN.	Dayton & Michigan	Lima, Ohio.
BISSETT, JOHN.	Cheraw & Darlington.	Florence, S. Carolina.
BRIGGS, R. H.	Mobile & Ohio.	Whistler, Alabama.
CHAPMAN, N. E.	Cleveland & Pittsburgh	Cleveland, Ohio.
CUMMINGS, S. M.		Boston, Massachusetts.
COOLIDGE, G. A.	Fitchburg.	Charlestown, Mass.
COOPER, H. L.	Lake Erie & Western	LaFayette, Indiana.
COOK, JAMES.	Danforth & Cook's Locomotive Works.	Patterson, New Jersey.
CROCKETT, JNO. F.	Boston, Lowell & Nashua	Boston, Massachusetts.
COOK, ALLEN	Chicago & Eastern Illinois.	Danville, Illinois.
DEVINE, J. F.	Wilmington & Weldon.	Wilmington, N. C.
ELLIS, J. C.	Schenectady Locomotive Works.	Schenectady, N. Y.
ECKFORD, JAMES.	Cincinnati, Hamilton & Dayton.	Cincinnati, Ohio.
FULLER, WILLIAM.	New York, Pennsylvania & Ohio.	Cleveland, Ohio.
FOSTER, W. A.	W. & M. Division, Fitchburg	Fitchburg, Mass.
FOWLE, J. W.	Cleveland, Col., Cin. & Indianapolis.	Delaware, Ohio.

NAME.	ROAD.	ADDRESS.
GRANGER, W. E.	Springfield, Athol & North-Eastern	Springfield, Mass.
GORDON, JAMES T.	Concord	Concord, N. H.
HAYES, S. J.	Illinois Central	Chicago, Illinois.
HOLLOWAY, J. W.	Cleveland, Columbus & Mt. Vernon	Akron, Ohio.
HODGMAN, S. A.	Philadelphia, Wilmington & Baltimore	Wilmington, Delaware.
JOHANN, JACOB.	Wabash & St. Louis	Springfield, Illinois.
KEELER, SANFORD.	Flint & Pere Marquette	East Saginaw, Mich.
KAUFHOLZ, F. G.	Cleveland, Col., Cin. & Indianapolis	Cleveland, Ohio.
LAUDER, J. N.	Northern	Concord, N. H.
McVEY, JOHN.	Alabama Great Southern	Chattanooga, Tenn.
PENDLETON, M. M.	Seaboard & Roanoke	Portsmouth, Virginia.
RICHARDS, GEORGE.	Boston & Providence	Boston, Massachusetts
STEVENS, GEO. W.	Lake Shore & Michigan Southern	Elkhart, Indiana.
SETCHEL, J. H.	Little Miami	Cincinnati, Ohio.
SEDGLEY, JAMES.	Lake Shore & Michigan Southern	Cleveland, Ohio.
SANBORN, A. J.	Indianapolis & St. Louis	Mattoon, Illinois.
STEARNS, W. H.	Connecticut River	Springfield, Mass.
SPRAGUE, H. N.	H. K. Porter & Co	Pittsburgh, Pa.
SIMONDS, G. B.	Chicago & St. Louis	Carondelet, Illinois.
STEEL, W. J.	Louisville & Nashville & Great South	Nashville, Tennessee.
TURREFF, W. F.	Cleveland, Tus. Val. & Wheeling	Elyria, Ohio.
WIGGINS, J. E.	Houston, East & West Texas	Houston, Texas.
WOODCOCK, W.	Central R. R. of New Jersey	Elizabethport, N. J.
WHITE, PHILIP.	Cleveland & Pittsburgh	Wellsville, Ohio.
WILLIAMS, E. H.	Baldwin Locomotive Works	Philadelphia, Pa.
WILDER, F. M.	New York, Lake Erie & Western	Susquehanna, Pa.
WIGHTMAN, D. A.	Pittsburgh Locomotive Works	Pittsburgh, Pa.
YOUNG, L. S.	Cleveland, Col., Cin. & Indianapolis	Cleveland, Ohio.
FORNEY, M. N.	Railroad Gazette	New York City.
LILLY, J. O. D.		Indianapolis, Indiana.
RAYMOND, J. H.	Secretary Railroad Association	Chicago, Illinois.

THE PRESIDENT — It has been our usual custom, at this time of the session, to give an opportunity to those who wish to sign the Constitution and become members of the Association; the Secretary will please read Article IV of our Constitution.

The Secretary then read Article IV of Constitution.

THE PRESIDENT — Gentlemen, an opportunity is now offered to sign the Constitution, and a recess of a few minutes will be taken for that purpose.

The following names were added to the roll of Members:

LIST OF NEW MEMBERS.

NAME.	ROAD.	ADDRESS.
SITTON, B. J	Selma, Rome & Dalton	Selma, Ala.
SWANSTON, WM	Jefferson, Madison & Indianapolis	Jeffersonville, Ind.
WATROUS, GEO. C	Detroit, Lansing & Northern	Ionia, Mich.
TWOMBLEY, THOS. B	Chicago, Rock Island & Pacific	Chicago, Ill.
McALPINE, A. R	Cleveland, Col., Cin. & Indianapolis	Brightwood, Ind.
SPITTLE, W	Valley	Cleveland, Ohio.
PARRY, CHARLES T	Baldwin Locomotive Works	Philadelphia, Pa.
GORDON, H. D	Philadelphia, Wilmington & Baltimore	Wilmington, Del
WEST, GEO. W	Syracuse, Chenango & New York	Syracuse, N. Y.
WEST, THOS	New York, Lake Erie & Western	Buffalo, N. Y.

After recess the President delivered his annual address, as follows:

PRESIDENT'S ADDRESS.

FRIENDS AND FELLOW-MEMBERS:

It is a pleasure and privilege to meet you in this city, where, thirteen years ago, we held our initial meeting, with a membership of forty at our adjournment. At the present we number one hundred and eighty. Many have joined our Association, and served with us during their experience as Master Mechanics; many have left the ranks for other business; some have assumed the duties of higher positions; others (and I am happy to say the number is not great) have gone before us to the untried future. Most, if not all, have left a good record behind them. As the names of those who have left us voluntarily have been dropped from the roll, their places have been taken by others who, in many instances, filled the position on the road thus made vacant.

We feel, justly, perhaps, that we have done some good to our profession. I, for one, must say, I have been greatly benefited by my connection with the Association. The social features of our meetings are very pleasant, and I think we are all benefited thereby.

Speaking of the social features of our gatherings, I would like to remind my fellow-members that although this is a great factor in the continued life and usefulness of our organization, still there is

something else—and for those of our members who are not as socially inclined as the rest of us, it is the only point worthy of consideration—I mean the benefit to be gained to our profession through our organization. It has seemed to me that for the past few years there has not been as much interest taken as there should be by a large portion—perhaps a majority—of our membership in both the before-mentioned features; and, as a result, both classes of our members are beginning to think that, perhaps, they are paying too dear for the benefit gained.

The point I wish to impress on you is this: We meet to benefit each other in our profession, and although, through adverse circumstances, we may not be able to carry out the improvements and changes suggested, yet we lose nothing by knowing them.

At our last meeting we were congratulating ourselves upon the prospect of better times, which then seemed just at hand. They came more suddenly and generally than the most sanguine of us dared to hope; and, as part of the better times, came an increased price or value on every commodity. It became evident, soon after the revival in trade commenced, that iron was advancing far beyond its actual value, and was so radically taking every thing with it in its upward strides, that something must occur to cut off the purely speculative portion of the advanced prices to prevent as sudden and ruinous a collapse and panic as followed 1873. With the enormously advanced speculative prices which prevailed in iron, came the importation of such vast quantities as to seriously threaten the entire iron industry of this country; but just when the danger was greatest, the men of forethought and nerve, who should have controlled the iron market from the first, came to the front and cut off the speculative price of iron, and restored the market to a firmer foundation. I trust they may not lose their grip.

With the advance in iron and other commodities came the advance of wages to a large part of the laboring population, and in fulfillment of their promise the majority of the railroads have now advanced or restored the rates to those of 1877, or previous to the last reduction. Let us hope the prosperous times may continue (which with abundant crops the coming season, would be almost assured), and that labor and capital may work in unison.

I am informed by your Secretary that death, the great leveler, has

invaded our ranks the past year, and reduced the number of our membership by the loss of two members—JOHN MINSHALL, of the N. Y & O. M. R. R., and J. B. WILSON, of the O. & M. R. R. I hope some suitable expression will be made by the Association in regard to the sad event.

For a statement of the financial condition of the Association, I refer you to the very able and satisfactory report of your Secretary.

Thanking you, gentlemen, for your attention, we will proceed to the next business in order, which is the Secretary's report.

Mr. Setchel then presented his report as follows:

SECRETARY'S REPORT.

To the American Railway Master Mechanics' Association:

GENTLEMEN—I herewith submit statement of membership, receipts, and such other matters as properly belong to the details of my office, for the year ending with this, our Thirteenth Annual Convention.

At our last annual meeting we numbered one hundred and sixty-one members. Since that time the Association has received twenty-one new members, and lost three, J. B. Wilson, M. M. of O. & M. R. R., at Vincennes, and John Minshall, of the N. Y. & O. M. R. R., deceased, and L. C. Noble, M. M. of Houston and Texas Central R. R., resigned—leaving our present membership one hundred and seventy-nine.

Twelve hundred copies of our Twelfth Annual Report, consisting of one hundred and eighty-four pages, of the usual size and style, were printed, and a copy sent to each member.

The Secretary having had numerous applications from roads not represented in the Association, for our reports, it was thought best by the Supervisory Committee to send our circular for contributions to the printing fund, with one-half dozen reports, and an optional bill for the same, to all the principal roads and locomotive works. These packages were sent, in most cases, free, by the express company, including in all six hundred and ninety-eight copies. Four copies, also, have been sold by the Secretary. The number sold, if any, by the Railroad Gazette, has not been reported. The total number of reports distributed being two hundred and seventy-five to members, six hundred and ninety-eight to railroad and locomotive companies, and four by sale, making in all nine hundred and seventy-seven, leaving two hundred and twenty-three copies still on hand.

The following are the railroads, locomotive works, and other companies that have contributed to the printing fund:

NAMES OF CONTRIBUTORS TO THE PRINTING FUND.

Burlington, Cedar Rapids & Northern (for two years)	$20 00
Nathan & Dreyfus	20 00
E. K. Porter & Co., Locomotive Works	12 00
Pittsburgh Locomotive Works	12 00
Connecticut River	10 00
Illinois Central	10 00
Cleveland, Columbus, Cincinnati & Indianapolis	10 00
Baldwin Locomotive Works	10 00
Philadelphia, Wilmington & Baltimore	10 00
Boston & Albany	10 00
Brooks Locomotive Works	10 00
Eastern Kentucky	10 00
Grand Trunk	10 00
Northern Pacific	10 00
Chicago, Burlington & Quincy	10 00
Atchison & Nebraska	10 00
Lake Shore & Michigan Southern	10 00
Des Moines & Fort Dodge	10 00
Savannah, Florida & Western	10 00
St. Louis, Iron Mountain & Southern	10 00
Cleveland & Pittsburgh	10 00
Mobile and Ohio	10 00
Chicago, St. Louis & New Orleans	10 00
Louisville, Cincinnati & Lexington	10 00
Kansas City, Fort Scott & Gulf	10 00
Chicago & Paducah	10 00
Atlantic & Great Western	10 00
New York, Lake Erie & Western	10 00
Missouri Pacific	10 00
Schenectady Locomotive Works	10 00
Atlantic, Mississippi & Ohio	10 00
Mineral Range	10 00
Atlanta & Charlotte Air Line	10 00
Delaware, Lackawanna & Western	10 00
Delaware & Hudson Canal Co.	10 00
Chicago & Eastern Illinois	10 00
Louisville & Nashville	10 00
Amount forward	$394 00

Amount forward	$394 00
Kansas Pacific	10 00
Fitchburgh	10 00
Chicago, Rock Island & Pacific	10 00
Canada Southern	10 00
Little Miami	10 00
Pittsburgh, Cincinnati & St. Louis	10 00
Cincinnati, Hamilton & Dayton	10 00
Chicago & West Michigan	10 00
Richmond & Danville	10 00
Pittsburgh, Cincinnati & St. Louis (C. C. & I. C. Div.)	10 00
Philadelphia & Reading	12 00
Northern of New Hampshire	10 00
Concord	10 00
Wabash, St. Louis & Pacific	10 00
Arkansas Midland	10 00
Houston & Texas Central	10 00
St. Paul & Duluth	10 00
Total amount, Printing Fund	$566 00
Amount receipts from dues	930 00
Cash for use MS., from Railroad Gazette	50 00
Reports sold	6 00
Total amount received	$1,552 00

For which I hold the Treasurer's receipts.

THE BOSTON FUND,

Consisting of thirty-seven hundred Four per Cent. Bonds, with accrued interest, as follows:

July 1, 1879	$37 00
October 1, 1879	37 00
January 1, 1880	37 00
April 1, 1880	37 00
Balance unapplied interest	5 31
Total	$153 31

Now amounts to $3,853 31.

All of which is respectfully submitted,

J. H. SETCHEL, *Secretary.*

THE PRESIDENT—You have heard the report of your Secretary. What is your pleasure in regard to it?

Mr. SEDGLEY, Lake Shore & Michigan Southern Railroad—Mr. President, I move it be received.

Carried.

THE PRESIDENT—The next business in order is the report of your Treasurer, which is in the hands of the Secretary, who will please read.

The Secretary then read the report of the Treasurer, as follows:

TREASURER'S REPORT.

S. J. HAYES, *Treasurer, in account with* CLEVELAND, OHIO, *May 11th*, 1880.

THE AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.

1879.		Dr.	1879.		Cr.
May 13	To Balance	$534 72	May 15	Voucher No. 1, J. H. Setchel, Secretary,	$600 00
May 15	" Cash from Secretary	363 00	May 15	" " 2, Reporter's Bill	60 00
May 19	" " " S. D. Company	15 00	May 19	" " 3, S. D. Company	15 00
Dec. 26	" " " Secretary	5 00	Dec. 26	" " 4, Exchange	25
Dec. 26	" " " "	170 00			
1880.			1880.		
Jan. 17	To Cash from Secretary	100 00	Jan. 17	Voucher No. 5, Exchange	25
Jan. 30	" " " "	100 00	Jan. 30	" " 6, "	25
Mch. 3	" " " "	100 00	Mch. 3	" " 7, "	25
Mch. 22	" " " "	200 00	Mch. 4	" " 8, Wilstach, Baldwin & Co.	691 15
May 4	" " " "	77 90	Mch. 22	" " 9, Exchange	25
May 10		421 10	May 4	" " 10, Wilstach, Baldwin & Co.	35 25
			May 4	" " 11, J. H. Setchel	42 65
					$1445 30
				Balance	$641 42
		$2086 72			$2086 72

Respectfully submitted,

S. J. HAYES, *Treasurer.*

THE PRESIDENT—You have heard the report of your Treasurer. What action will you take upon it?

Mr. BLACK, Dayton & Michigan Railroad—I move it be received.

Carried.

THE PRESIDENT—It has been our custom, and is necessary at this time, to appoint a Committee on Finance, to examine the accounts of the Secretary and Treasurer, and also to recommend the amount of assessment necessary to defray the expense of the ensuing year.

Mr. RICHARDS, Boston & Providence Railroad, moved the appointment of a committee, which was carried; and the President appointed the following members: George Richards, James Sedgley, and R. W. Bushnell, as such committee.

THE PRESIDENT—A Committee on Correspondence should be appointed to examine communications and determine what is proper to be brought before the Association.

Mr. BLACK, of the Dayton & Michigan Railroad, moved the appointment of such a committee, which was carried; and Mr. Black, Mr. Hayes, and Mr. Young were appointed the committee.

Mr. HAYES asked to be excused, as he would have to meet with the Finance Committee; for which reason he was excused, and Mr. Eckford substituted.

THE SECRETARY—If the Finance Committee will come forward, I will give them their papers.

THE PRESIDENT—According to a resolution passed in the Association, some two years ago, one hour each day—from twelve to one—was set apart for discussion upon any questions or subjects that might be proposed by members of the Association. Any one having questions that they wish to propose will please hand them to the Secretary, so that they may come up in regular order. The next business will be the report of your Committee upon the Construction of Locomotive Boilers, which is in the hands of the Secretary.

Report of Committee on Boilers.

To the American Railway Master Mechanics' Association:

GENTLEMEN—At your last Convention, held in the city of Cincinnati, May 13th, 14th, and 15th, 1879, the Committee on Boilers was continued, with the request that they report to the Convention, at its next annual meeting, on any matter of boiler construction or proportions that they might deem of sufficient interest to bring to the notice of the Convention not heretofore reported on.

Your committee held a meeting, in the city of Chicago, January 14th, 1880, at which all the members were present except Mr. Johann. After a general interchange of opinion by the different members of

the committee, and also of several other members of our Association, who were present, it was concluded that as the subject of locomotive boilers had been presented to the Convention at each annual meeting for the past four or five years, in lengthy reports, that as a committee, we would not attempt to make an elaborate report, such as had been made heretofore; but would leave each member of the Association—by a paper, or otherwise—to present their views on the subject of boilers to the Convention, as might seem desirable. Your chairman of committee was, however, directed to obtain further information in regard to the pattern of boiler known as the "Verderber" boiler, to which your committee alluded in their report to the Twelfth Annual Convention.

It will be remembered that Mr. Stefan Verderber, inspector-in-chief of the Hungarian State Railways, designed a pattern of locomotive boiler in which the water spaces around the fire box are dispensed with, the sides, back, and top of the fire box being composed of fire brick; the tube sheet, and a few inches of the cylinder part of the boiler alone being exposed to the direct action of the heat generated in the fire box; the tube surface being the medium through which the heat generated in the fire box is extracted from the hot gases as they pass through on their way to the smoke box.

By the kindness of Mr. M. N. Forney, of the Railroad Gazette, the chairman of your committee is informed that Mr. Verderber has made further trials with this form of boiler during the past year. The results, as stated by him, are, in substance, as follows:

Engine No. 104 (the trials of which were published in the Railroad Gazette, a few months ago)—after eight months' service, the boiler was found to be defective and in bad condition, at the part projecting into the fire box, at the bottom of the tube sheet, owing to sediment settling at that point, and sheets becoming overheated and burned. The tube sheet of this engine, and also that of another of same pattern of boiler, gave trouble from leakage, owing, doubtless, to the intense heat of the gases passing into the tubes, and the comparatively small proportion of the metal in contact with water. These engines were fitted with copper tubes. Another engine with this form of boiler, but fitted with a bridge in front of the tube sheet, similar to the brick arch, has been in service for seven months past, and has, so far, given no trouble from leakage of tubes or other

defects. Mr. Verderber does not give the results of fuel consumed and work done with this form of boiler, as compared with the common form of locomotive boiler.

The inference which your committee draw from the reports of the Verderber boiler is, that it has not yet been perfected sufficiently to warrant a series of close tests to determine as to whether, on the whole, that form of boiler is superior to the common form or not, or whether it is even equal to it. It would seem to us, that the intense heat generated in a fire box composed of fire brick must prove very destructive to the tube sheets and ends of the tubes, with a draft such as is necessary in the boiler of a locomotive.

We have nothing further to offer as a report. With the chairman of your committee the demands of business have been such that it was out of the question for him to give this subject any time in the matter of compiling a report, and on that account he requests your indulgence, trusting that all matters bearing on the subject referred to the committee may be fully discussed in open Convention with better and more satisfactory results than we could have disposed of them in a formal report.

Respectfully submitted,

R. WELLS, *Sup't Mach'y L. & N. R.*
Chairman of Committee.

THE PRESIDENT—You have heard the report of your Committee upon Boiler Construction. What is your pleasure in regard to it?

On motion, the report was received.

THE PRESIDENT—Gentlemen, an opportunity is now given for discussion upon the report.

MR. FORNEY, Railroad Gazette—Mr. President, I have been requested, by some of the members, to read some portions of a letter the most of which, I think, has been read in the report; but as I was not here when that report was read, and as it will take but a few minutes, I will read the whole of that portion of Mr. Verderber's letter that I feel at liberty to make public. I have, during the last year, taken so much interest in the experiments made in regard to boiler construction in the country to which Mr. Verderber belongs, that I went into correspondence with him to learn what success he had obtained, and this letter, which I will now read, is his reply. As I said before, a portion of this letter was contained in the report just read, but the letter can be better understood by reading the whole of that portion, and I

will also request Mr. Verderber to allow it to be published in the proceedings of this meeting.

Mr. Forney then read the letter already referred to by the committee.

MR. FORNEY—I will say, that before I left home I sent to Mr. Verderber for a drawing of the boiler with which he experimented, but it has not yet been received. When it comes to hand it will be printed, and all the members will have an opportunity to see it. I find, upon examination, that his experiments have produced some very good results, which will compare favorably with our fire boxes with water space. Mr. Verderber's patent of locomotive boiler is, as near as I can recollect, as follows: He designed a pattern of locomotive boiler in which water spaces around the fire box are dispensed with—the sides, back and top of the fire box being composed of fire brick, the flue sheet and a few inches of the cylinder part of the boiler being alone exposed to the direct action of the heat generated in the fire box, the tube surface being the medium by which the heat is extracted from the hot gases as they pass through them on their way to the smoke box. My own personal opinion of the matter, so for as I have been able to look into it, is that the Verderber boiler is in an exceedingly hopeful direction in which for us to look for improvement. If the plan can be carried out as proposed by Mr. Verderber, I think every Master Mechanic in this country should feel disposed to find it out. Although we may not like to go over to Hungaria for improvement in the construction of locomotive boilers, still, as that country seems to be able to give as good and better satisfaction in the improvement of locomotives than the roads in this country, every Master Mechanic should give it his attention and study. For my part I think his improvement is in the right direction; and which, I am sorry to say, is at present ahead of any improvement of the locomotive boiler which has been made by the Master Mechanics in this country.

THE PRESIDENT—The subject is still open for discussion.

MR. SPRAGUE, E. K. Porter & Co.—Mr. President, as this is a subject of very great importance, it is a pity to let it go past without full discussion; and, as I understand there is quite a number of members yet to arrive, I would move that further discussion be postponed until to-morrow morning at 9 o'clock.

THE PRESIDENT—In support of that motion, I will say that at the opening of the Convention I was informed that Mr. Johann, a member of that committee, was on his way here, and would arrive on the eleven o'clock train to-day. He has some drawings, which he wishes to present in connection with the report. I therefore think, taking every thing into consideration, it would be well to defer the discussion of this report until to-morrow morning.

Motion carried.

THE PRESIDENT—The next business in order is the report of your Com-

mittee on the Comparative Performance of Locomotives, with regard, chiefly, to economy in their operation. The Secretary will read the report.

Report on Performance of Locomotives.

To the American Railway Master Mechanics' Association:

GENTLEMEN—Your Committee, appointed at the last Annual Convention, to report on the subject of Comparative Performance of Locomotives with regard to economy in their operation, would respectfully report that they issued the following circular:

"The undersigned, a Committee appointed at the last Annual Convention of the American Railway Master Mechanics' Association, to report on the subject of

COMPARATIVE PERFORMANCE OF LOCOMOTIVES WITH REGARD TO ECONOMY IN THEIR OPERATION,

Respectfully solicit any information you may have bearing on the subject.

ENGINES.	Size cylinder and stroke.....	Number driving wheels.....	Number truck wheels.....	Diameter driving wheels.....	Weight on drivers.....	Total weight engines.....	Kind of fuel.....	Average grade....	Total cost per mile run.....	Average cost per car per mile hauled.....	REMARKS.
Eight-wheel,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ten-wheel ...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mogul	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Consolidat'n,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

"A blank form is here appended for convenience in giving dimensions and data of the four classes locomotives named in form, as the tendency is towards using a heavier class of locomotives for freight service, and the Committee desire to get all the data they can in order to make comparisons.

"Please state which class of engine, in your judgment and experience, is best adapted for heavy freight service, all things being considered."

In reply to the above circular your Committee received eight replies, all of which furnish very little data from which to make up a report such as we would desire to present to the Association.

Most of the replies are from members having in use the American or eight-wheel engine.

Mr. N. E. Chapman, Master Mechanic of the Cleveland & Pittsburgh Railroad, says, the engines on his road are nearly all of the eight-wheel pattern, having but five ten-wheel engines, which are not doing regular road service, from which to make comparisons.

He states there is no doubt in his mind but that the Mogul and Consolidation class of engines are the best engines for freight service when the speed does not exceed twelve miles per hour.

For a higher rate of speed the eight-wheel engine would be more economical.

Mr. G. A. Coolidge, Superintendent M. P. of the Fitchburg Railroad, says, that for heavy freight service on steep grades he considers the Consolidation class of locomotives the best; and for general freight service on undulating roads, with moderate grades, he prefers the Mogul class to those of the American, or eight-wheel engine.

They have in use, on this road, four Consolidation and fifteen Mogul engines.

No data received of work performed, or cost of doing the same. Form inclosed with weight, etc.

ENGINES.	Size cylinder and stroke.....	Number driving wheels.....	Number truck wheels.....	Diameter driving wheels.....	Weight on drivers.....	Total weight engines.....	Kind of fuel.....	Average grade..	Total cost per mile run.....	Average cost per car per mile hauled.....	REMARKS.
Eight-wheel,	15×24 16×24 17×24	4	4	5 ft.	39,000 42,000	62,000 69,000	Bituminous	.....	.....	.....	.....
Ten-wheel....	none.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mogul	17×24 18×24	6	2	4½ ft.	60,600 69,300	72,900 81,500	"	.....	.....	.....	.....
Consolidat'n,	20×24	8	2	4 ft.	87,000	100,000	"	.....	.....	.....	.....

Mr. James Sedgley, General Master Mechanic of the Lake Shore & Michigan Southern Railroad, in his reply inclosed a printed statement giving the performance of seven Mogul and seven American, or eight-wheel engines, with reference to economy in fuel consumed. The result shows a difference of $2\frac{2}{10}$ per cent. in favor of the Mogul engine. Form inclosed, giving data, etc.

Performance of seven Baldwin "Mogul" Engines. Cylinder, 16 *by* 24 *inches. Driving wheels,* 4 *feet* 6 *inches diameter. Year,* 1878.

No. of Engine.	Miles run.	Fuel consumed.		Miles run to one ton of coal.	Cars hauled one mile.	Pounds of fuel per car per mile.
		Tons coal.	Cords wood kindling.			
479	33,408	1,191	$46\frac{7}{8}$	26.96	1.391,824	
483	32,953	1,107	$45\frac{3}{8}$	28.60	1,454,803	
485	33,886	1,145	$46\frac{3}{8}$	28.45	1,351,333	
486	34,044	1,219	$46\frac{6}{8}$	26.91	1,408,255	
488	30,823	1,136	$42\frac{5}{8}$	26.16	1,285,486	
489	30,241	1,087	$42\frac{1}{8}$	27.67	1,326,382	
490	32,702	1,093	$45\frac{3}{8}$	28.76	1,350,366	
	228,057	7,978	$315\frac{3}{8}$	27.49	9,568,449	$1\frac{73}{100}$

Performance of seven Eight-wheel Engines. Standard wheels, 5 *feet. Cylinder,* 17 *by* 24 *inches.*

367	31,209	1,035	$42\frac{5}{8}$	28.97	1,302,087	
368	32,799	1,230	$45\frac{7}{8}$	25.72	1,317,479	
370	33,367	1,177	$45\frac{5}{8}$	27.30	1,416,577	
372	30,898	1,086	$43\frac{1}{8}$	27.36	1,261,484	
375	33,857	1,132	47	29.77	1,393,610	
376	29,997	1,030	$41\frac{1}{8}$	28.	1,278,855	
377	28,973	1,086	$39\frac{7}{8}$	25.83	1,154,292	
	221,100	7,776	$304\frac{5}{8}$	27.36	9,124,384	$1\frac{77}{100}$

One cord kindlings rated one ton coal. Percentage in favor of Moguls, $2\frac{1}{8}$ per cent. Average train haul, Moguls, $41\frac{95}{100}$. Cars, eight-wheelers, $41\frac{34}{100}$. Two empty cars rated as one loaded.

Mr. L. Finlay, Master Mechanic of the St. Louis, Iron Mountain & Southern Railroad Co., writes that they have only the eight-wheel engine on the Arkansas Division of his road. Can give no comparative data; considers the ten-wheel engine the best for heavy freight service, all things considered. Form inclosed.

ENGINES.	Size cylinder and stroke.....	Number driving wheels.....	Number truck wheels.....	Diameter driving wheels.....	Weight on drivers.....	Total weight engines.....	Kind of fuel.....	Average grade....	Total cost per mile run.....	Average cost per car per mile hauled.....	REMARKS.
Eight-wheel,	15×22	4	4	5′	36,700	59,800	Wood	.....	16.14 cts.	.....	28 loads full train.
Eight-wheel,	16×24	4	4	5′	41,300	66,400	"	.....	16.94 cts.	.....	32 loads full train.
Eight-wheel,	16×24	4	4	4′ 6″	38,700	63,000	"	.....	16.89 cts.	.....	36 loads full train.

Mr. W. O. Hewitt, Master Mechanic of the Toledo, Peoria & Warsaw Railroad, states they have but one class, the eight-wheel engine, on his road, and sends form filled up complete, giving data of performance with cost of same.

ENGINES.	Size cylinder and stroke	Number driving wheels.....	Number truck wheels.....	Diameter driving wheels.....	Weight on drivers	Total weight engines.....	Kind of fuel.....	Average grade....	Total cost per mile run	Average cost per car per mile hauled.....	REMARKS.
Eight-wheel,	16×24	4	4	62″	42,500	64,200	Bituminous or soft.	Extreme 83′ to mile	13.72 cts.	.083 cts.	Freight cars equal to loaded.
Ten-wheel	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mogul	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Consolidat'n,	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

*This is the only class of freight engines that we have on road. I have no experience with the other classes.

From a statement received of the performance of a Consolidation engine, working on a mountain grade of 184 feet to the mile, on the New Mexico & Southern Pacific Extension of the Atchison, Topeka & Santa Fe Railroad, we find this engine hauled 258½ tons, not including weight of engine, on the above grade, at a speed of eight miles per hour; this is considered by the officers of the road equal to what could be done by two ordinary engines of the American or eight-wheel class.

Dimensions of the engine are as follows: Cylinder, 20 by 26 inches; total wheel base, 22′ 10″; diameter of driving wheel, 42 inches; weight on driving wheels, 100,000 pounds. Total weight of engine in working order, including water in tank, 115,000 pounds.

NOTE.—This engine has a tank on the boiler, and is known as "Uncle Dick."

Mr. Woodcock, Master Mechanic of the Central Railroad of New Jersey, furnishes a statement of the performance of a Consolidation engine—cylinder, 19 by 24 inches—used on that road. This engine has made a total mileage, during the past year, of 40,025 miles, with an average

Cost of repairs	$2\frac{8}{10}$
Cost of fuel	$7\frac{8}{10}$
Cost of stores	$\frac{8}{10}$
Cost of engineer, fireman and wipers	$5\frac{9}{10}$
Total	$17\frac{3}{10}$

Miles run to ton of anthracite coal, $19\frac{6}{10}$; weight of train hauled in tons, exclusive of engine and tender, 785 tons; average grade, 21 feet to the mile.

These items are taken from printed annual statement for year 1879.

He also states they have just received and put into service eight new Consolidation engines—cylinders, 20 by 24 inches—to be run in the same service as the former engines, and thus far they are pleased with the manner in which they perform their work.

Your Committee are of the opinion that the Consolidation engine is destined to be the coming engine for heavy freight service. They have received a statement from the Baldwin Locomotive Works (where the first Consolidation engine was built in the year 1866, and

placed in service on the Lehigh Valley Railroad), giving the number of this class of engines built at their works in comparison with the Ten-wheel and Mogul engines, from the year 1866 to 1879, inclusive, as follows:

Year.	Ten-wheelers.	Moguls.	Consolidation.
1866	34	.....	1
1867	7	1	8
1868	52	5	9
1869	144	3	3
1870	48	8	7
1871	61	30	4
1872	149	53	4
1873	19	50	9
1874	19	33	2
1875	11	19	15
1876	15	30	9
1877	.....	48	17
1878	7	84	18
1879	33	41	110
Total	599	405	216

This statement shows a very large percentage of increase in the Mogul and Consolidation engine, particularly in the last few years.

In conclusion, your Committee are of the opinion that for heavy freight service, and with a speed not to exceed twelve miles per hour, the Consolidation class of engine is best adapted, all things considered, for general freight service; and with a speed not to exceed fifteen miles per hour the Mogul engine will give very good results.

For fast freight, and where a speed of twenty miles per hour is sometimes necessary, the American, or eight-wheel engine, would, no doubt, be the most economical.

Your Committee would here take this opportunity to return thanks to the members who have replied to their circular, but regret they have not received more data, especially from the members using the Consolidation engine, in order that they might present to the Association comparative statements.

Very respectfully,

WM. WOODCOCK, *M. M., C. R. R. of N. J.*
S. A. HODGMAN, *M. M., P., W. & B.* } *Committee.*

THE PRESIDENT—You have heard the report of your Committee. What action will you take upon it?

MR. HAYES, Illinois Central Railroad—I move the report be received, and placed on file.

Motion carried.

THE PRESIDENT—There is now an opportunity for discussion upon the subject.

Mr. SPRAGUE, Porter, Bell & Co.—What do I understand was the proportion of Mogul engines built by the Baldwin Locomotive Works for narrow and standard guage roads?

THE SECRETARY—It does not specify.

Mr. SPRAGUE—My impression is that a larger portion of Mogul engines are being used on the narrow guage roads than on the standard guage, although the report does not give a fair comparison. If we had the figures as to the number built for narrow and standard guage roads, we could make better comparison. I understand the Denver & Rio Grande Railroad are using quite a number of Consolidation engines.

Mr. WOODCOCK, Central Railroad of New Jersey—Mr. President, I believe the Denver & Rio Grande Railroad are using the Consolidation engines exclusively; and, as far as my observation goes, I think the Consolidation engines are rapidly gaining in favor. I am sorry there is no one here who represents that road to give us definite information.

THE PRESIDENT—I think they are using Consolidation engines exclusively.

Mr. SPRAGUE—That is one road that is using one class of locomotives. There are, perhaps, a great many other roads that are using nothing but Mogul engines, and I would like to hear the members express themselves on this point.

Mr. HAYES, Illinois Central Railroad—From what I can learn the Consolidation engine is going ahead in some parts of the country, but in the West they are not generally used. For heavy freight service we are getting Mogul engines on our road. We are building several, and I have no doubt they will be adopted for freight service. We have some with a twenty inch cylinder; and I have seen these Mogul engines, with a twenty inch

cylinder, haul as many as one hundred cars in a train without any difficulty. They were four wheel cars, but they carried nine tons in a car, and the engines seem to do the work easily, and we have no difficulty with them. The Consolidation engine may do better for heavy mountain grades, but for through freight we prefer the other, and will soon have ten of these engines on our through freights. I would like to hear from the members present as to what they are doing, for there is an impression in the minds of the Committee that the Consolidation engine is the engine for heavy freight service.

Mr. SPRAGUE, E. K. Porter & Co.—My impression is that the report of the Committee was in favor of the Consolidation engine for the narrow guage roads; of course, I am aware of the fact that they are using them more in the East than in the West.

Mr. SIMONDS, Chicago & St. Louis Railroad—Do you mean the Mogul, or the Consolidation?

Mr. SPRAGUE—I mean the Consolidation.

Mr. HAYES, Illinois Central Railroad—In reply to our friend, Mr. Sprague, I would say that the Consolidation engines, I believe, are not used in the West for heavy freight service. The Mogul engine is coming into use pretty generally, especially where you have through freight. We have four Moguls that have been in use now for about five years; and we have just received three new ones—18 by 24 inch cylinder—and we are building three more, which will make ten Moguls that we will have put in the through freight service within two months. I agree entirely with the Committee that where you run for a short distance—say, from ten to fifteen miles—the Consolidation engine may give better satisfaction; but for through freight service the Mogul is entirely the best engine for the West—for heavy freight business —and the ordinary eight-wheel engine for way freight and passenger business.

Mr. WOODCOCK, Central Railroad of New Jersey—Mr. President, Mr. Sedgley made a statement in regard to the Mogul engine on freight service. Perhaps he will give us some more information in regard to the use of them.

Mr. SEDGLEY, Lake Shore & Michigan Southern Railroad—In regard to the statement given of the performance of engines, I might qualify it by saying that it was called out by a letter from the Baldwin Locomotive Works, in regard to the performance of thirteen engines which are now on our road. I found that seven of them—16 by 24—were on the East Division, and had been in continuous service during the year. We also selected seven of what we term a standard engine—17 by 24, five foot wheel, with boilers corresponding—and, as that report shows, the Mogul engine gave us the best results. There was no discrimination against any on account of fast runs, and they were not, for the most part, in favorable service. These Mogul engines hauled more cars than standard engines and cost less for fuel. It should be borne in mind also, that these engines were not doing their best.

We were, at the time this trial was made, running very heavy trains every day. We generally hauled forty loaded cars in a train, rating five empty to three loaded cars. The engines were all run an average of fifteen miles per hour, and the result in both classes of engines was very satisfactory, when we consider that the boilers of the Mogul engines were not large enough for so heavy trains; but I am obliged to say that the Mogul engines gave the best results, and I have come to the conclusion that, for heavy service, where we have no light trains, the Mogul engine is the engine for us to handle heavy freight with. I do not mean to say that a 16 by 24 inch cylinder is the best size for a Mogul engine; but I think, with an 18 by 24 inch cylinder, where there is heating surface enough to supply the cylinder, etc., we will get decidedly better results from the Mogul engine than we can possibly get with our eight-wheel engines. It is a well-known fact to all gentlemen present that in all our eight-wheel engines you carry thirty-three per cent. more fire than we do with the Mogul, and get no benefit from it. With the Mogul engine you are able to equalize the fire and adhesion of the engine; and I have no doubt that this class of engines will soon come into general use.

Mr. SPRAGUE, E. K. Porter & Co.—I would like to inquire if there are any other members here who are using both the Mogul and Consolidation engines on their road? In the East, I believe, there are a great many roads getting Consolidation engines, but I do not know of any road that is fully equipped with them.

THE PRESIDENT—Any further discussion on this subject?

Mr. SEDGLEY, Lake Shore & Michigan Southern Railroad—I move we take a recess.

THE PRESIDENT—Shall we dispose of this subject?

Mr. SEDGLEY—I move the discussion upon the performance of locomotives lay over until to-morrow morning.

THE PRESIDENT—There is already one subject laid over until to-morrow morning at nine o'clock; and this would come up after that in its order.

Mr. SEDGLEY—I believe there is quite a number of members who will be in this afternoon and to-morrow morning, that are not here now, and, perhaps, it is best to lay it over.

The motion was then carried.

THE PRESIDENT—According to our usual custom, about the hour of twelve, we generally have a recess of ten minutes.

Mr. LAUDER, Northern Railroad of New Hampshire—I move a recess of ten minutes be taken.

Carried.

AFTER RECESS.

THE PRESIDENT—According to the resolution introduced two years ago, the hour from twelve to one is set apart for discussion upon any question or subject that may be presented by the members. The Secretary has several, which he will read in the order in which they have been presented.

The Secretary then read the following:

"Is Button Boiler-set Riveting Reliable and Practicable in Boiler Consruction?"

Mr. SETCHEL, Secretary—Mr. President, according to agreement, or an understanding, the member presenting the question is to give his views first, and on this account I may be pardoned for taking the initiative in the discussion which may follow. I have had no experience in this form of riveting, but it is practiced on some first-class roads, and is represented to me as a great saving in boiler construction, which, if true, may prove a profitable subject for us to investigate. Two years ago, I paid a visit to the shops of the Louisville & Nashville Road and while there, I noticed they were doing all their riveting with the button set and two laborers with heavy hammers, only one skilled man being required in a gang. This method of riveting the superintendent of the works and several other parties that were present, said was perfectly reliable, and that no trouble was experienced from the boiler's leaking, and that it was less than half the ordinary expense of hand riveting, and recommended it very highly. Others, to whom I have spoken in regard to the matter, condemn it, and say it does not fill the rivet holes, and the seams are not tight; and finally, it has been discarded in the old country some time ago, which settles the question with them. Well now, it seems to me, that if we can draw out the facts in the case, we may be able to determine whether this system is reliable or not; and if so, it is certainly very much cheaper, and if practicable, we can save a great deal of expense in the construction of our boilers by its adoption. The hole, it is claimed, is not so well filled; but why a blow of the sledge, properly directed, is not as effective in pressing the rivet into the hole as the more numerous blows of the light riveting hammer, would be very hard to explain; and the fact that the driving of the rivet is finished at a much higher temperature with the button set gives it greater contracting power on the seam than hand riveting, and that argument falls to the ground. I would like to hear from the members present in regard to this matter, because I, for one, would like to adopt it if it is a good thing—for it is so much cheaper that it would be perceptibly felt in the operation of the machinery department, and in these days of sharp competition it would give a larger margin of profit.

Mr. BOON, Pittsburgh, Fort Wayne & Chicago Railroad—I have never had any personal experience with unskilled labor riveting. Some years ago, upon investigating the matter, I found that this hand riveting of the boilers by unskilled laborers gave considerable trouble. The rivets are often spoiled and made worthless; and I have also found that the cost of steam riveting was fifty per cent. less than hand riveting. In steam riveting they can drive a rivet a minute, but that is a low average, and when they are properly driven, they are a very good job, and are very superior to hand riveting.

Mr. SETCHEL, Little Miami Railroad—Mr. President, Mr. Boon misunder-

stood me. The process I had reference to was where one man holds a "*set*" over the rivet, and a couple of laborers would do the hammering.

Mr. BOON, Pittsburgh, Fort Wayne & Chicago Railroad—That was about about the same way I had reference to—the set was put over the rivet, and the hammering done by two laborers.

Mr. HAYES, Illinois Central Railroad—Mr. President, there is one boiler shop in Chicago that has been following this process for years. The process employs but two laborers and one skilled boiler maker. The hollow set is put over the rivet, and that is pounded with sledges by the two laborers; but, I suppose with steam riveting you can drive three rivets to one by hand. I agree with Mr. Setchel—that is, I think the hole is hardly filled as well, because it is done so much quicker, and hence, the iron is hotter; but at the same time, I think, as he says, the advantage gained is greater than the loss, in the hole not being filled quite so well. I believe, if it were adopted, that it would very much cheapen the repairs upon our locomotive boilers. There is also now, I believe, a process of solder riveting, with which I am not well acquainted. If there is any person here who has seen it, I would like to get their views upon it, as well as upon the other processes of riveting.

Mr. SPRAGUE, E. K. Porter & Co.—The question of filling the holes depends upon the manner in which the rivets are heated. There is another method—that by heating the rivet and cooling the point, you can hammer it down thin with the set, and the hole will be as well filled as when riveted in any other manner; and it certainly makes a first-rate job. There is no difficulty in this plan, whatever, and my experience has been in favor of adopting it in preference to any other.

Mr. HAYES, Illinois Central Railroad—I think Mr. Sprague misunderstood me. I say, when you have skilled workmen, and hence drive the rivet by hand, you have got considerable less heat than you will have by the steam process—the rivet remains hot, but it afterward contracts in cooling.

Mr, SPRAGUE, E. K. Porter & Co.—Mr. President, it will take a man a minute or a minute and a half to drive a rivet; he will keep pounding upon the rivet, and by the time he gets through the cooling process will be gone.

Mr. SEDGLEY, Lake Shore & Michigan Southern Railroad—Mr. President, I am very glad that this question is up for discussion; but suppose it is a well known fact to all the gentlemen here that the button-set riveting is considered inferior. I know of a case that came under my observation, and I can say that my experience has been, that the button-set riveting is very much inferior to hand riveting. I do not think it is possible for a man to make as good a job with a button set, as by hand; but I do not wish to be understood that I object to steam riveting, for I think when steam riveting is properly done it is much superior to any other form.

Mr. HAYES, Illinois Central Railroad—I would like to ask Mr. Sedgley what the difference is between button-set riveting or steam riveting, as the tool used in forcing up the rivet is nothing more than a button-set. In the one case you use steam, and in the other you use a mall; and, it seems to me the result will be the same in either case.

Mr. SEDGLEY, Lake Shore & Michigan Southern Railroad—Mr. President, in reply to Mr. Hayes, I would say, there is a vast amount of difference between a steam machine, thirty or thirty-six inches in diameter, forcing against a rivet, and a man with a sledge. If you have ever been at Pittsburgh, at French & Wells', manufacturers of springs, and seen this process of putting on bands under hydraulic pressure, and putting them on in the old way with a sledge, then, I think, you would see that the difference of riveting by hand and steam is very great. I do not think it is possible for a man to set a rivet with a mall as well as you can with a steam cylinder ram. You can only get a certain amount of pressure on by hand riveting; and, as I said before, I find it is a very inferior job.

Mr. HAYES, Illinois Central Railroad—I admit, with Mr. Sedgley, that the difference in the process of riveting with steam and by hand is just the the same as it would be when twenty-five or thirty years ago we used to make our boilers on wheels; it is done quicker, but I do not know that it is very much better—and I think this is the case with the button-set riveting. The point is, whether it would not be better to use the button-set rivet than the old process of driving by hand, where it will take a minute or two longer.

Mr. SETCHEL, Little Miami Railroad—Mr. President, Mr. Hayes takes the argument that I was going to make to Mr. Sedgley right out of my mouth. It seems to me there is very little difference between the operation of a steam hammer driving home a rivet and that of a man striking the button set with a mall, which is exactly the same so far as the shape of the rivet is concerned; and if the blow that a man inflicts with a sledge drives the rivet home, and fills the hole, I do not see what the difference is between the blow struck by the operation of the steam and that of the man. I can not, for the life of me, see any difference. If such work is so much quicker, and a long line of road, like the Louisville & Nashville, practice it, and say they are perfectly satisfied with it, there must be something in it Then, if my friend Mr. Sedgley has practiced this, and found that it would not answer his purpose, there is an argument on the other side; but if it is only a matter of prejudice against the system, we ought to know it. That is what we come here for—to find out the best way of doing work in the shortest possible time.

Mr. SEDGLEY, Lake Shore & Michigan Southern Railroad—I agree with our worthy friend Mr. Setchel that if the button set riveting fills the holes just the same as steam riveting, it is just as good; but, on the other hand, I do not think it is possible to fill the holes as well by hand as it can be done

by steam; then, again, this process was practiced thirty years ago, when there was no steam riveting, and it was abandoned because the government rejected it, and still rejects it to-day.

Mr. YOUNG, Cleveland, Columbus, Cincinnati & Indianapolis Railroad—Mr. President, I have seen a great many bad specimens of button-set riveting, but I think it was caused more by bad workmanship than any thing else. I am of the opinion that a good job can be made with the button set.

THE PRESIDENT—If there is no further discussion upon the subject of riveting, a motion to close the subject will be in order.

Mr. HAYES, Illinois Central Railroad—I would like to ask Mr. Sedgley if there was so much objection to the button-set riveting, why all of our locomotive tanks are made with button-set riveting?

Mr. SEDGLEY, Lake Shore & Michigan Southern Railroad—I will answer my worthy friend's question by asking him another. If button-set riveting is good, why did you not have that button set put in your boilers as well as tanks?

Mr. HAYES, Illinois Central Railroad—Simply because boiler makers object to it.

Mr. LAUDER, Northern Railroad of New Hampshire—Mr. President, I am gratified to hear this discussion in regard to button-set riveting. I believe in the survival of the fittest. Now, thirty years ago there was a great deal of button-set riveting done on boilers, and, if that system was a good one, I think we would be using it to-day. Of course, it is cheaper to have but one skilled man, and the rest laborers in riveting a boiler; but if that system was satisfactory in every respect, it seems to me it would not have died out in the practice of building locomotive boilers. That fact, to me, is conclusive that there is something wrong, although, personally, I never had any experience with it.

Mr. HAYES, Illinois Central Railroad—Mr. President, I simply wish to say to Mr. Lauder that we are now using in all our boilers button-set riveting; and, I think, pretty nearly all the railroads on the continent are doing the same thing. All steam riveting is button-set riveting, except that one is done by the hand and hammer while the other is done by a steam ram, but it is button-set riveting all the same. Hence, every locomotive on the coast, and every one in the United States, that is riveted by steam is button set.

Mr. LAUDER, Northern Railroad of New Hampshire—Mr. President, I agree with Mr. Hayes in regard to that, but it seems to me that there is a great difference between a steam machine, that with one blow forces the metal into every part of the hole, and a man hammering in the rivets with a mall at a very moderate pressure, which, after the rivet shrinks, is left loose in the sheet. However, if it can be proven that this practice of riveting can be done satisfactory, I am, of course, in favor of adopting it.

Mr. HAYES, Illinois Central Railroad—The only reason why I did not adopt this plan of button-set riveting was simply because the boiler makers were, in every instance, entirely opposed to it.

Mr. SETCHEL, Little Miami Railroad—Mr. President, when Mr. Hayes replied to the question of Mr. Sedgley, that the reason why he did not use the button set on his boiler was because the boiler makers were opposed to it, he touched the secret of the whole matter. I noticed in the paper, a few days ago, where a strike was going on in certain boiler shops because the proprietors had introduced this system of riveting. It does away with skilled boiler makers, and puts unskilled men in their places; and it seems to me that this is the greatest trouble with this plan—the boiler makers are opposed to it.

Mr. SIMONDS, Chicago & St. Louis Railroad—Mr. President, I do not think that any manner of riveting the boiler is better than steam riveting. In hand riveting there is considerable shrinkage takes place, and I can not see why one heavier blow is not better than a succession of light blows, that cool the rivet and weaken the iron. I am of opinion that button-set riveting is really stronger than the hand-riveting process.

THE PRESIDENT—Any further discussion?

Mr. HAYES, Illinois Central Railroad—I move discussion upon this subject be closed.

Motion carried.

THE PRESIDENT—The Secretary will please read the next question.

The Secretary then read the following:

"What is the Best Method of Annealing Steel Sheets?"

Mr. HAYES, Illinois Central Railroad—The object in asking that question was that some of the members seem to think that annealing of sheets after being flanged, was detrimental to the strength of the boiler. Some four or five years ago, the Chairman of the Committee on Construction of Boilers recommended this practice; but there are some of our members who think annealing after flanging is very apt to spring the steel. On our road, we anneal them over a wood fire, which is a very simple process; but sheets annealed in this way never crack.

Mr. ORTON, Canada Southern Railroad—Mr. President, the method of annealing steel plates, so far as my experience and knowledge goes, is that the annealing of the plates should be entirely with a wood fire (and never with coal), which will undoubtedly improve the quality of the steel, and, indeed, in my opinion, is absolutely necessary. When I was manager of a shop, on one of the roads in England, I have witnessed the cracking of sheets from the want of proper annealing. All of our annealing there was done by a wood fire; and, if necessary, we kept a man up till two o'clock in the morning, in order to get an even fire. In my opinion, annealing should be done in no other way than with a slow, even wood fire, and I believe then they will seldom or never crack.

Mr. SEDGLEY, Lake Shore & Michigan Southern Railroad—I would state that the practice on our road is to anneal all steel sheets after flanging, which is only carrying out a well known principle of equalizing the strain. For instance, in case of a tube sheet, you flange the sides, and it leaves an undue strain on the water side, and we have had a number of sheets crack the entire length, that, in my judgment, annealing would have prevented. We use a furnace with a bed of steel rail, and light wood for a fire. This is a question I should be glad to hear discussed by the members.

THE PRESIDENT—Gentlemen, discussion is now in order.

Mr. BOON, Pittsburgh, Fort Wayne & Chicago Railroad—Mr. President, it is my opinion that to anneal sheets without the proper facilities for doing so is simply out of the question. To make a good job in annealing sheets, you must have the proper furnace. I have seen some methods of annealing that left the sheets in about the same condition they were after flanging. I find, in my experience, furnaces using reflected heat are the best. They are entirely free from any gases.

Mr. WOODCOCK, Central Railroad of New Jersey—I believe that some of our manufacturers say that it is not necessary to anneal sheets. On our road we anneal all our plates, and we never have any difficulty from the sheets cracking.

Mr. SETCHEL, Little Miami Railroad—Mr. President, I would like to hear from some of the locomotive builders; and as I do not see any of them present but Mr. Sprague, I would like to inquire what his practice is in building locomotives; whether they think it necessary or not to anneal steel sheets?

Mr. SPRAGUE, E. K. Porter & Co.—Mr. President, so far as annealing of sheets is concerned, we do not anneal very much. We put in small sheets without annealing; and, in other cases, we use a wood fire, and put the sheets on a level floor to cool. Whether this plan is a good one or not, I do not know, but we rarely have much trouble in that direction, and never have any sheets crack in service. I have given no attention to erecting annealing furnaces, never having seen any necessity for them.

Mr. WOODCOCK, Central Railroad of New Jersey—I move discussion on this subject be closed.

Motion carried.

THE PRESIDENT—The hour for discussion upon these questions having about expired, there is a paper on the Secretary's table which I would like to have read. It is in regard to having a Standing Committee appointed upon Subjects, every year, and has been prepared, and is presented by our associate member, Mr. J. H. Raymond, of Chicago.

The Secretary read the following:

Question by J. H. Raymond.

Whether it would be good policy to so amend the by-laws as that each active member should be annually fined, under penalty of expulsion, $10 for each circular of inquiry sent him by a Standing Committee to which he does not make answer on or before the 30th of March; and that Standing Committee shall immediately tabulate, print, and distribute the reports, so that they may be in the hands of the members, for their individual consideration, prior to the Annual Convention, and that each associate member shall contribute a paper to be read before the Association—not less than one in five years, as may be indicated by the President.

Mr. RAYMOND, of Chicago—Mr. President, being an associate member, I wish only to say that I have taken a great deal of pleasure and interest in the work of the Association, and I consider it an honor to belong to it—and if there is any thing I can do, at any time, to promote its success, I shall take great pleasure in giving the Association the benefit of any knowledge that I possess; but its success depends almost entirely upon the methods used by our Standing Committee to procure information. I think there should be a committee on the different subjects, who should obtain from the members their experience, and with their own investigations present them to the Association, in tabulated form, so that it will be of some benefit. Now you have at this meeting, out of one hundred and eighty members, about sixty-five present. We would better have an Association of twenty-five members who will answer these questions every year, than one hundred who will not answer them at all. Then the chairman of committee would depend on these replies, and be sure of having something to present to the Association, and members who had answered these circulars would come here prepared to discuss the subjects intelligently. I think it would produce a good result to fine the members who do not answer the circulars sent them. Some of the circulars sent out last year were only answered by ten or fifteen members, and now what I want is for the Association to devise some improved method of obtaining information, or make the old one more effective—and for that purpose I have introduced this question, and if it will be in order, I would move it be referred to the Committee on Correspondence, or such other committee as may be thought best, who will take the matter into careful consideration and report back to the Association before we adjourn to-day.

Mr. SPRAGUE, E. K. Porter & Co.—I understand that associate members have a right to make a motion.

THE PRESIDENT—Yes, sir; they have all the privileges of active membership except that of voting.

Mr. RAYMOND, of Chicago—Mr. President, then I move that the paper be referred to a select committee of five.

Mr. SETCHEL, Little Miami Railroad—Before this question is put I want to say a word. Mr. Raymond's suggestion reminds me of an old gentleman down at Cincinnati, who had been lobbying the City Council for a number of years to procure the passage of an ordinance providing for the opening of a street that, as every one supposed, would give himself and neighbors a front entrance to their property at an equal division of the expenses; but when the street was finished, it was discovered that he had so manipulated the ordinance that the street just came to his line, and stopped, which gave him all the privileges without any of its burdens. He had no fines or assessments to pay. Now, my friend Raymond, seems to think that in order to bring the Association up to the highest point of usefulness, somebody must be fined; and he (and I expect Forney had a hand in it) has drawn up this resolution in such a manner that the fine—like the street—just comes up to them, and stops. Now, Mr. President, when the article of constitution of this Association was formed for the admission of associate members, it was expressly understood that these members should, from time to time, present the Association with papers on such scientific subjects as they might select for consideration and discussion, or in some way render the Association substantial benefit; and if these gentlemen are requested to prepare a paper, and do not comply, and we can not fine them, I do not see what they are good for. I admit that every member is pleased to see the genial face of Mr. Forney and other associate members, from year to year, but if that ten dollar fine is to be put into execution, I, for one, want it to apply to the associate members also; but I think that a move of this kind will be bad for the Association—for I am afraid that hereafter you would find the associate members missing at our annual gatherings. I am, and I think you will find a majority of the members are, opposed to the project.

Mr. SPRAGUE, E K. Porter & Co.—As I understand it, associate members are not required to present any papers for the Association, only Master Mechanics. I would be in favor of a resolution that requires the associate members to prepare a paper to be read before the Association once in every five years; that, out of our fifteen members, would give us three papers every year.

Mr. RAYMOND, of Chicago—I will accept that as an amendment, and let it go to the Committee.

THE PRESIDENT—Mr. Sprague, will you please add that amendment to the resolution?

Mr. ORTON, Canada Southern Railroad—Mr. President, I should not like to be one of the Committee to wade through one hundred and eighty docu-

ments, but I think it is highly necessary that every member should answer these circulars, as far as he possibly can. Still, I do not think it is right to impose a fine upon a member for not doing so. I find, in a great many instances, questions asked that I do not like to answer, because I think that every Master Mechanic, at the head of a first-class shop, ought to know them; and I am not in favor of fining members for not answering circulars containing such questions. One more word—now, in the Master Car Builders' Association, when they decide to bring a question before the Convention, they appoint a committee of three or five, with instruction to get whatever information they can on the subject, and are not restricted as to the means of gaining the information. They may communicate with any member, or any body; and we have found this plan to work very satisfactorily. I think it would do better for the Committee to ask the members for information, but if circulars are sent out promiscuously,-I would certainly object to any penalty for not answering.

Mr. LAUDER, Northern Railroad—I would like to say a word upon this resolution before it is submitted to a vote. I am fully alive to the importance of taking a new departure in our methods of obtaining information for our Committee Reports. Committees are now appointed, and collect what information they can, which is tabulated and presented to the Association at our annual meeting, and the matter is in such shape that it is of little use to us for the purpose of discussion. I think our members should answer the Committee's questions fully and promptly, in order to give the Committee time to digest the matter, and put it in such shape as to make it a credit to themselves and interesting to the Association. In regard to our associate members, I think any one of them should be willing, and should be required, to contribute a paper at least once every three years. It will be expected, of course, that they will select their own subjects, but the paper is to be read before the Association and incorporated in the proceedings; and I think every associate member has the qualifications that will enable him to prepare a paper that will be an honor to him and the Association, which will give our reports character at home and abroad. Some of these members have already done so, which has been a great benefit to us, and no doubt to them. Mr. Miles, at one time, presented a very creditable paper; and Mr. Sellers has favored us several times; and I have no doubt that every associate member will willingly respond to such an invitation.

Mr. RAYMOND, of Chicago—Mr. President, referring to the remarks of Mr. Lauder, I would say that I am willing to commence the programme this year. I value your proceedings very highly, and am willing to do anything to sustain and perpetuate your existence. I have something that I wish to say to the members, and if you will pardon me for the intrusion upon your time, and, if agreeable to you, I would suggest next Thursday morning, at nine o'clock, as the time when I will present the matter for your consideration.

THE PRESIDENT—Mr. Raymond, from the general expression of the members, I judge it will be agreeable. Gentlemen, you have heard the motion; what is your pleasure in regard to it? The motion is to refer the matter to a commitee of five.

Motion carried.

THE PRESIDENT—I will appoint on that Committee, Mr. Raymond, Mr. Boon, and Mr. Forney.

Mr. RAYMOND, of Chicago—I think a majority of that Committee should be active members. I beg, therefore, to withdraw my name, in favor of Mr. Forney, as a representative of the associate members. I think all important questions should be left to the decision of active members, and as the fine question is an important part, I think its decision should be left to them.

Mr. ORTON, Canada Southern Railroad—Are there any more associate members that want to draw out? You associate members seem to know all at once that this penalty question is an important one. Mr. Forney is one of our oldest members, and Mr. Raymond proposed the question, and therefore I do not think it would be fair for either one of these gentlemen to decline serving on the Committee.

Mr. LAUDER, Northern Railroad—I hope both these gentlemen will remain on this Committee. If you want a majority of active members, I move that four active members be added to the Committee. I think that will be a fair proportion.

Motion carried.

THE PRESIDENT—I will add to that Committee, Mr. Orton, Mr. Woodcock, Mr. Kaulfholz, and Mr. Hodgman; and I would say to that Committee it would be well for them to get together and work on this question, outside of the meeting hours. The report of the Finance Committee, I am informed, is in the hands of the Secretary, who will please read it.

Report of Finance Committee.

To the American Railway Master Mechanics' Association:

GENTLEMEN: The Committee have examined the accounts of Secretary and Treasurer, and find them correct; and would recommend an assessment of five dollars upon each member to defray the expense of the Association for the ensuing year.

GEO. RICHARDS,
J. SEDGLEY,
R. W. BUSHNELL,
} *Committee.*

THE PRESIDENT—I believe that the Finance Committee has usually collected the assessment, and I would like for them to be near so that the members can pay their dues without any great inconvenience. Gentlemen,

you have heard the report of your Finance Committee; what action will you take upon it?

Mr. BLACK, Dayton & Michigan Railroad—I move the report be accepted.

Motion carried.

THE PRESIDENT—The next business in order is the report of your Committee on the "Best Means of Preventing Smoke from Locomotives, with due Economy in Fuel.' The report is in the hands of the Secretary, who will please read it.

Report on Best Means of Preventing Smoke.

To the American Railway Master Mechanics' Association:

GENTLEMEN: Your Committee appointed to report on "The Best Means of Preventing Smoke from Locomotives, with due Economy in Fuel," would beg to submit the following:

A circular was issued, for the purpose of eliciting information from the different Master Mechanics in the United States and Canada. Few answers were received, and these, with four or five exceptions, were brief, presenting simply the conclusions arrived at, but not the facts and statistics on which they were based.

The circular of your Committee was as follows:

"CHICAGO, January 1st, 1880.

"The officers of the American Railway Master Mechanics' Association, at their annual meeting, held in Cincinnati, May, 1879, appointed the undersigned a Committee on the subject of 'The Best Means of Preventing Smoke from Locomotives, with due Economy in Fuel.'

"In order that the Committee may make as full and comprehensive a report as possible upon this subject, they desire to get the experience and results of experiments made by the different Master Mechanics of the country who are using bituminous coal for fuel.

"*First.* Do you use a fire box in your locomotive different from that ordinarily used, for the purpose of preventing smoke? If so, please describe it.

"*Second.* Have you used the fire-brick arch, or any peculiar mode of admitting air to the fire? If so, please describe it, and state with what success.

"*Third.* To what extent can air be admitted to the fire box,

above the grates, before it becomes detrimental to the steaming qualities of the engine?

"*Fourth.* Do you think it possible, with bituminous coal, to prevent the emission of smoke from a locomotive running with a full train over an undulating road? If it can be prevented, describe the appliances producing such result.

"Please give any other information you may possess bearing upon this subject.

"An early reply will greatly oblige,

E. T. JEFFREY,
H. A. TOWNE,
SANFORD KEELER, } *Committee.*

"Please address your reply to E. T. Jeffrey, Superintendent, Illinois Central Railroad, Chicago, Illinois."

In past years, reports have been laid before you, giving the comparative results obtained with coal-burning engines, having plain fire boxes, and fire boxes arranged with water tables or fire-brick arches. We do not deem it necessary to recapitulate herein the facts submitted.

Before presenting our recommendations, we invite your attention to the following letters from Messrs. N. E. Chapman, James M. Boon, Jacob Johann, and W. H. Purdy, believing that the observation and experience of these gentlemen have enabled them to embody in their communications views and suggestions which should command the attention of the Railway Master Mechanics of the country.

"PENNSYLVANIA COMPANY,

OPERATING THE CLEVELAND AND PITTSBURGH RAILROAD.

Office Master of Machinery,

CLEVELAND, OHIO, March 5, 1880.

"E. T. JEFFREY, Esq., *Sup't Ill. Cent. R. R.*, Chicago, Ill.

"DEAR SIR—In answer to your circular of January 1st: We use the plain fire box, without brick arch. We are now using upon our locomotives, in the passenger service, what is known as the

'Smith stack,' the same as has been in use upon the Pennsylvania Railroad for some years. In addition to it we are using an arrangement for admitting air to the fire box, above the fire, by inserting four two-inch tubes, both in front and back of fire box, with a small jet of steam admitted just at the outer end of the tube. It is an old English device, known as the 'Clark's patent.' The patent has, however, expired, I am told. The introduction of steam to the tube is to create a current of air. I have not yet determined just what amount of air is necessary to give the best combustion. I am trying some experiments, by closing or reducing the size of the tubes, to ascertain about the requisite amount. Professor P. H. Dudley claims that the results of his experiments show that too much air has generally been admitted above the grate or from below.

"We are getting excellent results from the use of the straight, or Smith's stack, in connection with Clark's smoke-consumer. Our general manager, in a ride over our line, recently, behind an engine so equipped, expressed himself after this fashion, at the end of the trip: 'Chapman, it was the cleanest ride I ever had, either behind a wood or coal-burning engine.' I find that judicious firing is absolutely necessary to cleanliness.

"In answer to your fourth question, I do not believe it possible to use bituminous coal as a fuel for hauling heavy freight trains at a moderate speed, without the emission of smoke, and considerable of it. The time is so short, or the combustion so rapid, that it is, I believe, impossible, practically, to consume, in the locomotive fire box, the gases which form the smoke. The time must be extended, and the consumption slower, to do it. Great relief from the nuisance can be had by the fireman using good judgment in putting in coal. There is also great difference in the coals found in the various sections of the country, hardly any two of which require the same treatment.

"Trusting the foregoing may be of some service to you, I remain,

"Yours truly,

"N. E. CHAPMAN, *Master of Machinery.*"

"E. T. JEFFREY, ESQ., *Chairman Committee on 'The Best Means of Preventing Smoke from Locomotives, with due Economy in Fuel.'*

"I would say, in answer to your circular:

"*First.* We use the ordinary fire box.

"*Second.* Have used the fire-brick arch with hollow stay-bolts. The first row of these bolts was seven inches above top of grates, the next row four inches above these holes; the holes were three-eighths of an inch in diameter; there were sixty-two in all. With this arrangement, we found that we could get about seven miles more to a ton of coal than could be made with the same engine without the arch and with the hollow-stays plugged up. The combustion was almost perfect; if properly fired there would be no smoke from the stack. About the time we were using the brick arch we were having considerable trouble with fire-box sheets cracking, and we thought the arch might be in part the cause of the trouble, and abandoned it. Was at that time, and am now, very favorably impressed with the brick arch, and believe, with the fire-box steel (now being manufactured), the arch can be used to advantage. Have also used the Clark steam jet. This is an English invention, and was used there about 1857. It consists of holes in the fire box, about the line of the top of the fire, about twelve or fifteen inches from center to center (depends on length of fire box), also holes in back end of fire box; these holes to be from one and a half to two inches in diameter, each one to have projecting in from outside a small tube, say three-eighths of an inch diameter inside, the opening of this tube at end to be closed to about one thirty-second of an inch; these tubes to be connected with steam-pipes from boiler, regulated by a cock within reach of the engineer and fireman. The idea was to blow steam through these small tubes into the fire box, carrying the air with it, and forcing it into the gas, supplying the necessary air to produce combustion of the gases. By opening or closing the steam cock, the admission of air could be regulated—increased when fresh coal was placed on, or diminished as gases were burned. There is not much saving of coal by this arrangement with an engine the boiler of which has to be forced to keep up steam. With a heavy train at slow speed the gases will all be consumed; with a heavy train at high speed they will be partly burned;

at high speed with a light train all will be consumed. With large boilers of ample capacity very good results are obtained.

"*Third.* The extent to which air can be admitted to a fire box before it becomes detrimental to the steaming qualities of a boiler has not, that I am aware of, been definitely settled. Am of the opinion that with boilers fed with bituminous coal there should be provision made for a free admission of air, so arranged that the quantity admitted can be regulated, or entirely shut off, if necessary.

"*Fourth.* I believe that the emission of smoke from bituminous coal, burned in the fire box of a locomotive, can be prevented with any kind of a train or road. To prevent it, the first essential point is good firing. No matter what the appliances are, or how good they may be, bad firing will cause the emission of smoke from the stack. With an expert fireman good results can be obtained with a plain fire box. Next to good firing, large boilers and fire boxes are necessary. They should be so large that the full power of the engine would be developed without forcing the fire. As a general thing, our locomotive boilers are too small. The fire has to be forced from the start to keep up steam.

"I believe we will never get the proper results from burning coal in locomotive furnaces until the men on engines are educated to fire properly and with some idea of combustion. There is an insane notion with them that a coal-burner engine is not burning the fire right unless the black smoke is rolling from the stack; and instead of trying to prevent smoke, they are actually trying to make it. It will be found, I think, without exaggeration, that ninety-five engineers and firemen out of one hundred will so express themselves, and they evidently believe it.

"JAS. M. BOON."

"E. T. JEFFREY, H. A. TOWNE, and SANFORD KEELER, *Committee on 'The Best Means of Preventing Smoke from Locomotives, with due Economy in Fuel.'*

"DEAR SIRS: In reply to your circular on this subject, I will submit the following answers to your questions in their order:

"*First.* I have nothing special or new, and am only using the ordinary square fire box.

"*Second.* I have used the fire-brick arch, and also hollow stay-bolts, to admit air above the fire; but have now entirely abandoned their use, for the following reasons:

"*First.* While the brick arch was hot it materially reduced the volume of black smoke and the expulsion of cinders, thereby effecting more perfect combustion; but this advantage was more than counterbalanced by the increased cost of additional repairs necessitated by the use of the brick arch, both in keeping the arch and the fire box in repair.

"*Second.* In the use of hollow stay-bolts I found no particular advantage—and for the particulars of my reasons for abandoning their use I refer you to my report and tabulated statement in the Twelfth Annual Report of the Master Mechanics' Association, on pages 80 and 82, respectively.

"*Third.* With the average bituminous coal used on this road, I should say that two hundred and thirty cubic feet of air is required to effect thorough combustion of one pound of coal—and whether admitted entirely through the grates, or partly through the grates and partly through hollow stay-bolts above the grates, any total quantity admitted per pound of coal in excess of this amount will prove detrimental to the steaming qualities of the engine, which will be manifested in two ways:

"*First.* It reduces the temperature of the gases in contact with the heating surfaces, and, if the excess is very great, it is apt to cool the gases below the point of ignition, in which case they would pass out the chimney and be wasted.

"*Second.* It increases the volume of the gases beyond what is necessary, which increased volume, in order to escape, must pass through the flues with greater velocity, thereby diminishing not only the temperature of the gases but also diminishing their time of contact with the heating surfaces, thus preventing them from imparting to the water the maximum quantity of heat. If the quantity of air admitted is too little to effect perfect combustion, valuable fuel is lost by the escape of unignited gases.

"In my practice, as previously stated, I have found, by actual experiment, that with a large fire box, with properly constructed grate-bars, and a fire not over six inches deep, a sufficient quantity

of air can be admitted through the grate and fire bed to cause complete combustion; and that the use of hollow stay-bolts, under such circumstances, proves exceedingly detrimental to the engine's steaming qualities.

"*Fourth.* I am not aware of the existence of any method or device that will entirely overcome the emission of smoke, from the combustion of bituminous coal, that can be used with any degree of economy. A careful and observant engineer and fireman, by proper manipulation can, however, mitigate this nuisance to a great extent.

"Very truly yours,

"JACOB JOHANN, *Master Mechanic.*"

"CHICAGO, ST. LOUIS & NEW ORLEANS RAILROAD CO.

Office of the Superintendent of Machinery,

McCOMB CITY, MISS., March 6, 1880.

"E. T. JEFFREY, Esq., *Chairman, etc.*

"DEAR SIR: My reply to your circular of January 1st has been delayed by the pressure of other duties. There is not much that I can say, but I respectfully submit the following answers to your questions:

"*First.* We use the plain fire box in such of our locomotives as burn bituminous coal.

"*Second.* No, sir; I do not know that any device for preventing smoke has ever been used on this road.

"*Third.* I think air may be admitted above the grates with beneficial results so far as the consumption of smoke is concerned, and without detriment to the steaming qualities of the engine; but I do not think this can be accomplished by any fixed or automatic arrangement placed beyond the control of the engineer. A fresh fire requires more air to be mixed with the gases liberated from the coal, and the quantity of air admitted should vary with the nature of the work being performed by the engine. To get the best results from the admission of air, the device should be under the control of the engineer or fireman, and would require very frequent attention—

perhaps more than could at all times be given by the person in charge.

"*Fourth.* I do not think it is practicable, and I scarcely think it possible, to entirely prevent the emission of smoke, under all circumstances, from an engine burning bituminous coal. I have never seen a device that would effect this result. Air openings, brick-arches, etc., will assist in effecting a more perfect combustion of bituminous coal; but I think the objections to them are sufficient to off-set any advantages that might be derived from their use. So far as I have been able to observe, the best prevention of smoke is care and intelligence in firing. If these were generally exercised, I think we should consume at least one-half of the coal that now escapes from the stack in the form of smoke; our engines would show better results from the fuel used, and the people who ride in our trains or live along our lines would have but little cause to complain of the nuisance arising from the use of bituminous coal-burners.

"Respectfully yours,

"W. H. PURDY, *Sup't of Mach'y.*"

Mr. James Sedgley, of the Lake Shore & Michigan Southern Railroad, states that the plain fire box is used on his line; that, with repeated tests, he finds no benefit in using the fire-brick arch; and that the best results are obtained by using one row of hollow stay-bolts with quarter-inch holes all around the fire box.

Mr. W. O. Hewitt reports experiments made with engines Nos. 41 and 42, on the Toledo, Peoria & Warsaw Railroad; the engines are duplicates, with furnaces five feet three inches long, two feet eleven and one-half inches wide, and four feet ten inches high. No. 41 was run with a plain fire box, and no air openings above the fire. No. 42 had a fire-brick arch, and eighty hollow stay-bolts with one-half inch holes, placed in two rows, and distributed as follows: twenty-five on each side, twenty in front, and ten in the back of furnace. The lower row was six inches above the top of grate. The engines were employed in freight service, and each hauled an average of seventeen and one-half loaded freight cars. No. 41 averaged thirty-nine and eight-tenths miles per ton of coal; No. 42 averaged thirty-

four and six-tenths miles per ton of coal. The general dimensions of the engines are not given in Mr. Hewitt's communication.

Your Committee are of the opinion that it is impracticable to lay down a fixed rule giving the proportions of locomotive boilers designed to burn bituminous coal. The heating qualities of different coals vary greatly; and the grate area, number of square feet of heating surface, size of fire box, and, in fact, the general dimensions of boilers should be varied to correspond with the evaporative capacities of the different coals. Where the evaporative power of coal is small, large boilers and furnaces are an absolute necessity for the economical consumption of fuel and the lessening of the smoke nuisance, because coal which has limited heating capacity contains a large proportion of foreign substances, which occupy a portion of the grate-surface and fire box, which would be available for the purposes of combustion with a fuel having greater heating capacity, and consequently fewer impurities.

It may be said that the foregoing is more in the interest of economical consumption of coal than the prevention of smoke. To this we say that the two must inevitably go together. When economical consumption of fuel is obtained, the emission of smoke is reduced to a minimum. Economical consumption of coal means the burning of all the combustible substances contained in the coal, either in solid or gaseous form. If this could be attained, there would be no emission of smoke, in the proper meaning of the word, but of a slightly colored gas resulting from combustion.

The following table shows the heating qualities of some of the Western coals, with which experiments have been made on the Illinois Central Railroad:

Experiments with Western Coals, on Illinois Central Railroad.

State.	Name of Mine.	Service of engine.	Miles run.	Pounds of coal used.	Pounds of water evaporated.	Pounds of water evaporated to one pound of coal.
Illinois...	Moss Bank	Freight.	541	32,953	169,008	5.13
" ...	Tamaroa	"	538	33,322	184,738	5.54
Indiana..	Brazil (Block)	"	1,334	74,845	410,013	5.48
Illinois...	Fairbury	"	533	34,085	173,847	5.10
" ...	Enterprise, Du Quoin	"	537	35,413	176,067	4.97
Iowa....	Fort Dodge	"	476	38,928	146,823	3.77
Illinois...	La Salle (Mine not stated)	"	531	38,825	173,041	4.46
" ...	Wilmington	"	537	38,153	182,117	4.77
" ...	Union, No. 2, Du Quoin	"	528	34,220	184,940	5.40
" ...	Carbondale	Pass'ger.	1,104	42,396	268,067	6.32
" ...	"	Freight.	768	46,312	285,644	6.17
" ...	Northern Illinois, La Salle	"	512	41,341	194,418	4.70
" ...	Oglesby, La Salle	"	512	40,744	204,812	5.03
" ..	Illinois Valley, La Salle	"	512	38,743	192,949	4.98
Iowa....	Oskaloosa	"	241	19.590	95,950	4.90
" ...	Crooked Creek	"	881	75,778	327,216	4.32

It will be seen that the evaporative capacity varies from 3.77 pounds of water for one pound of coal for Fort Dodge, Iowa, coal, to 5.48 for Brazil, Indiana; 5.54 for Tamaroa, Illinois; and 6.32 for Carbondale, Illinois, coal in passenger, and 6.17 in freight service.

The heating capacity of Fort Dodge coal is sixty per cent. of the Carbondale coal. It necessarily follows that the area of grate, capacity of furnace, and extent of heating surface required for the proper combustion of Carbondale coal would prove insufficient for the Fort Dodge coal. Were a boiler proportioned, so far as grate area, size of furnace, and square feet of heating surface are concerned, for Fort Dodge coal, it would have far greater capacity for generating steam if the Carbondale coal were used; the grate area

could be reduced proportionately, better combustion of fuel be obtained, and correspondingly less smoke emitted, which, however, would be due to the purer quality of coal used.

The less the heating capacity of coal, the greater should be the area of the heating surfaces in the boiler. Where there is insufficient heating surface in the boiler, a forced combustion is necessary; or where the heating capacity of the coal is small, the boiler must be forced beyond its legitimate capacity, unless the grate area and heating surface are proportioned to suit the poor quality of coal which is being consumed,

It is a strong, though safe assertion, that there has not been built a locomotive boiler *of sufficient capacity* to insure proper combustion of fuel. Size, weight, and form are arbitrarily limited and bounded by the substructure and track on which the motive power moves. With an ordinarily proportioned locomotive engine, taxed to her greatest capacity, only three-fourths as much water can be evaporated per pound of coal as with a well-proportioned stationary boiler, having a good natural draft and proper area of grate for the quality of fuel used.

Irregular and careless firing serves to aggravate the evils attendant on the forced combustion necessary in locomotives; and results not only in a waste of fuel, but also in the emission of volumes of black smoke.

Your Committee urge that locomotive boilers be constructed of the largest possible capacity consistent with a proper and safe weight upon the rails. This is the first and most important element in the prevention of smoke, with due economy in the consumption of fuel. Next in importance is careful firing. Locomotive engineers and firemen must be educated to a higher standard in this regard. As the amount of steam used varies with the loads hauled, the grade climbed or descended, and the speed attained, so also must the amount of coal consumed vary; and locomotive engineers and firemen should be required to feed fuel to the boiler in proportion to the work being performed. It is a common practice for firemen to throw a large amount of coal into the furnace at one firing. That which is on top is rapidly coked by the heat underneath, and the gases generated escape unconsumed. An equal amount of coal placed in the furnace in three or four firings, at intervals of from

three to five or six minutes, would, in many instances, evaporate twice as much water as when used in the careless manner designated, and the smoke emitted would be practically unobjectionable to the traveling public or the citizens of the various towns and villages through which our railways run.

The admission of air above the fire is of material advantage in well-proportioned boilers, as it affords better combustion of the gases generated in the furnace, and lessens the amount of smoke. An arbitrary rule, fixing the amount of air which should be thus admitted, can not be followed. The admission of cold air above the fire impairs the steaming power of boilers the capacity of which is small in proportion to the size of the cylinders. Where boilers have large capacity and combustion is not forced, the admission of air through tubes or hollow stay-bolts, or by any other practicable means, is beneficial.

The amount so admitted should vary with the quality of the fuel used. Coal which permits the rapid generation of gases should have a larger quantity of air than that from which gases are not so readily thrown off.

Referring to the table given herein, showing the evaporative quality of different coals, it is apparent that the Fort Dodge coal, which evaporates but 3.77 pounds of water to a pound of coal, and which does not permit the rapid generation of gases, would require the admission of but little air above the fire; while the Carbondale coal, which evaporates 6.17 pounds of water to a pound of coal, cokes readily and emits gas rapidly, would require, in a large, well-proportioned boiler, a free admission of air to the furnace to secure proper combustion.

It is evident that when a well-proportioned boiler is taxed to its full capacity, more air is required above the fire than when it is worked to one-fourth or one-half its capacity. It is, therefore, seen that when arrangements are made to admit air means should be provided for regulating the amount in proportion to the work done and coal consumed. Careless firing will defeat all efforts which are made toward economical consumption of coal and prevention of smoke. Large boilers, admission of air, and the use of good coal will not reach the object sought if careless firing is permitted.

The money expended by railway companies in experiments with

water-tables, fire-brick arches, peculiar-shaped furnaces, brick walls, and mid-feathers has doubtless proved *what ought not to be done.* Your Committee venture the opinion that the same amount of money would have been expended to better advantage had it been used in teaching men how to fire locomotive engines.

Large boilers and fire boxes, and careful firing are the "Best Means of Preventing Smoke from Locomotives, with due Economy in Fuel."

Respectfully submitted,

E. T. JEFFREY,
H. A. TOWNE,
SANFORD KEELER, } *Committee.*

THE PRESIDENT—You have heard the report of your Committee; what is your pleasure in regard to it?

Mr. SPRAGUE, E. K. Porter & Co—I move it be received.

Motion carried.

Mr. HAYES, Illinois Central Railroad—As it is a little past the hour, I move we now adjourn.

Mr. ORTTON, Canada Southern Railroad—Mr. President, I was going to suggest that we vary from our usual custom in regard to the nomination of officers, and not wait until the last minute before we take any action. It has been suggested to me, and I approve of the idea, that a committee be appointed to nominate officers, so as to give every member an opportunity of thinking for whom he will vote.

THE PRESIDENT—That committee can be appointed the first thing to-morrow; a motion to adjourn has been moved and seconded, and is first in order.

Motion carried, and Convention adjourned at 2:30 P. M., until 9 o'clock A. M., on Wednesday, the 12th.

SECOND DAY'S PROCEEDINGS.

The Convention was called to order at 9 o'clock—President Chapman in the chair.

THE PRESIDENT—Gentlemen, the report of the Committee on the Construction of Locomotive Boilers was read yesterday, and the discussion deferred until the opening of the meeting this morning. Mr. Johann, a member of the Committee, who was not present yesterday, is here this morning, and, I understand, has something further to add to the report of the Committee.

Mr. SETCHEL, Little Miami Railroad—Mr. President, I move that the vote, whereby discussion upon the report of the Chairman of the Committee on Boilers was made the special order for 9 o'clock this morning be reconsidered.

Carried.

Mr. SETCHEL, Little Miami Railroad—I now move that the paper of Mr. Johann be taken up, read and discussed jointly with that of Mr. Wells.

Carried.

Mr. JOHANN, Wabash & St. Louis Railroad—Mr. President, having been associated with Mr. Wells, Chairman of Committee on Boiler Construction, for the last two years, in getting up the reports of Committee, I intended this year to vary the programme somewhat, and make a series of practical tests. The two boilers referring to engines 152 and 105 were specially constructed for the purpose of testing the difference between these two classes of boilers, and ascertaining, if possible, which would give the best results, and report the same to this meeting. But the business on our road has been so heavy that I could not take the time of the engines to make the contemplated experiments; and as my worthy colleague, Mr. Wells, has been transferred to a larger field of operation, and being very busy with his new duties, it has prevented our having a more lengthy report. But I would say that I propose to carry out my experiments fully this year, and will try and give you the full benefit of my experience for our next annual meeting.

Mr. Johann, then read the following paper:

Paper on Boiler Construction, by Jacob Johann.

GENTLEMEN—In previous meetings of this Association I have expressed myself very strongly in favor of the "straight-top" type

of locomotive boiler, and I propose, in the following paper, to give my reasons for such a preference.

Owing to the character of the water used on our road, we have been troubled in the past by heavy deposits of sediment, which, despite frequent washings out, will, in the course of a year's time, completely fill the space between the crown bars and a large portion of the space between the flues. This sediment, after it becomes hard, as you are all well aware, can not be removed short of the the chisel and hammer, and by rolling the flues.

The proper way to remedy this evil would be to purify the water before it gains admittance to the boiler, but as this, so far, has not been done in a satisfactory manner, it becomes necessary for us to reduce the effects of these deposits to a minimum, by mechanical contrivances in the structure of the boiler itself.

The first thing that suggested itself to me, conducing to such an end, was to lessen the liability of sediment lodging on the crown sheet, and becoming baked and converted into scale. This I have endeavored to accomplish by arching and sloping the fire-box crown sheets as much as was permissible, and by using long stays in place of crown bars. The reasons presenting themselves for adopting such a course being as follows:

First. For sloping and arching.

It was obvious that the sediment would be less liable to be deposited on a slanting and arching surface than on a level surface, and at the same time the arching would aid, in a great measure, in supporting the crown sheet. Still another advantage presented itself, which, though having no bearing on the lessening of deposit, was of no small importance, namely: Owing to the sloping and arching, and to the fact that the guage-cocks are set from the highest point on the crown, there is no possible chance of uncovering the crown sheet while going up or down a heavy grade, or in the rolling of the engine while rounding sharp curves, as long as the boiler shows one guage of water on a level; while with the straight crown such danger has frequently manifested itself by burnt crown sheets.

Second. For the use of long stays.

The use of crown bars, with their accompanying bolts and washers, causes a considerable portion of the heating surface of the crown to be nullified, and at the same time furnishes a most ready

means for the lodgment of sediment, with the still further disadvantage of rendering the surface almost inaccessible for purposes of scraping and cleaning. It is no unfrequent occurrence to find the space between the bars and the crown sheet completely filled with hard scale, as well as a large portion of the space between the bars. By using long stays it is obvious that the liability of deposit is diminished in a great degree, and an almost perfectly open crown sheet secured, which is easily accessible for purposes of cleaning and washing. The use of these long stays necessitates the placing of the dome in front of the fire box, which I, however, consider an advantage, instead of a detriment, for the following reasons:

First. It is nearer the center of the longitudinal oscillation of the boiler, and consequently there is less agitation of the water at that point and less liability to "swashing" and priming.

Second. It places the dome more nearly over the point where the greatest amount of steam is generated.

By using a large dome and dome-ring opening, a boy may be let down at any time, with hose and scraper, and readily remove any scale that may have accumulated without disturbing the throttle pipe.

As to the weakening effects of placing the dome over the barrel, I have prevented them by flanging the boiler sheet as well as the dome sheet, and using in addition a three-quarters by six inch wrought-iron ring, which takes the dome-flange rivets, and at the same time is riveted to to the boiler sheet by independent rivets.

For keeping the barrel of the boiler free from sediment, I have succeeded most admirably by spacing the flues farther apart and using a less number, and by the employment of a boiler-washing device, which was explained to the Convention at the last annual meeting, a description of which may be seen in the last printed report of proceedings. This device keeps the bottom of the boiler clear, and prevents the forming of a foundation for the sediment to climb up between the flues. In fact, so perfect is the working of the washer that upon opening the boiler at any time for inspection after washing out, the rivet heads are seen as plainly as when the boiler was first made.

The first one I used was put in the boiler of an engine in August, 1878, and on opening the boiler for inspection in April, 1880, the

bottom of the boiler was found to be perfectly clear, and the flues in reasonably fair condition. Without this device we would have been compelled to remove the whole, or greater portion, of the flues, at least within a twelvemonth from the time of being put in.

In summing up, you will observe that I have endeavored to go to work in a systematic manner and reduce to a minimum the evil effects arising from a rapid sedimental deposit, by mechanical contrivances in the boiler structure itself; and the results attained have convinced me that I have succeeded, in a great measure, in so doing.

To determine the practicability, to my own satisfaction, of the use of long crown stays instead of crown bars, for the purpose of lessening the chances of deposit of sediment on the crown sheet, I constructed, in January, 1879, a straight boiler for a 15 by 22 inch cylinder engine, with an inside diameter of 46½ inches; the dimensions of the fire box being as follows:

Length, 59 inches; height, sloping, 62 inches in front, 57 inches at back; width at bottom 34¼ inches, at the top 39¼ inches. The crown sheet being arched with a radius of 35½ inches; the horizontal angles being round, with a radius of 10 inches.

This boiler has been in service since April, 1879, having entirely come up to my expectations, and is to-day in perfect condition.

This engine is engaged in running passenger trains of five and six cars each, between two points on the road, together with three other engines of the same sized cylinders; the latter having much larger heating surface but less water capacity; and although no special tests have been made, the average miles run to the ton of coal, from May, 1879, to April, 1880, shows most favorable results for the boiler with the least heating surface but larger water capacity —which increased water capacity is due to the absence of crown bars, the arching and sloping of fire box, and a less number of flues. This average for the time stated was 42.43 miles run to the ton of coal used, while the other three made 40.69, 35.90, and 36 00 miles to the ton respectively.

The success of this boiler encouraged me to build another, on a larger scale, and during the summer of 1879 I built two, 17 by 24 inch cylinder engines of standard pattern, being identical throughout, with the exception of the boilers.

For one, I built a "wagon-top" boiler, using crown bars and a flat crown sheet, the following being the general dimensions:

Boiler, tapering, 49 inches inside diameter at front, 52 inches at back; rise of wagon-top 10 inches; fire box, length 66 inches, width 34⅝ inches, height 70 inches; water space 3½ inches all round; height of back head 96 inches; flues, 190 in number, 2 inches outside diameter, 11 feet 6 inches long.

For the other I built a straight boiler, using an arched and sloping crown, stayed by long stays to the boiler crown, of the following general dimensions:

Inside diameter of smallest ring of boiler 52 inches; height of back head 87 inches; fire box, length 66 inches, width 34⅝ inches; height, sloping, 70 inches at front, 64½ inches at back, slope being at the rate of one inch to the foot; crown sheet arched, 35 inches radius, with round angles—13 inches radius at flue sheet, 10 inches radius at fire-door sheet; flues, 160 in number, 2 inches outside diameter, and 11 feet 6 inches long.

I used steel as the material for these boilers and fire boxes, the barrels being $\frac{7}{16}$ inches in thickness, riveted with ¾ inch rivets, being made of extra strength for the purpose of carrying 150 pounds pressure; the stay bolts also being of steel, with the exception of the long stays in the straight boiler, which are of "Sligo iron."

The chief difficulty I encountered in the case of the straight boiler was in overcoming the disadvantages of the acute angle at which the long stays on the outer rows passed through the crown sheet and shell, this angle being so sharp in some cases that the outside shell would not have one complete turn of the thread on the stays.

I overcame this difficulty, however, by running the side sheets entirely to the top, allowing them to butt together, and then running down over them an extra sheet far enough to receive all the long stays. The stays were then extended up nearly normal to the crown sheet, the arching of the crown rendering this possible, and the the double thickness of the shell furnishing sufficient hold for the stay-bolt threads; this extra sheet at the same time materially increasing the strength of the boiler crown. These stays are one inch in diameter, the outer ends being upset to an inch and an eighth for a short distance. The fire-box crown being tapped for an inch, and

ıe boiler crown for an inch and an eighth bolt, special taps and ɜamers being made for the purpose. The outer ends of these stays, ʔter they were screwed into position, were riveted over to a reasonɔly-sized head, while the inner ends were merely hammered and ıttened out, and so far these stays have exhibited no signs of ɜaking.

My design in building these two boilers after different types, but ith the same machinery, was to obtain the most favorable circumances under which to make a comparison as to the relative merits the two types; and it was my intention to have made a series of ɛperiments this Spring, with the object of ascertaining by indisıtable facts the superiority of the one over the other, in an ecoɔmical point of view, if any such superiority existed; but circumances, in the shape of increased business, have prevented me from ɔing so up to the present time.

There are a few differences, however, which I am enabled to give, ıat are in favor of the straight boiler, among which are the folɔwing:

First. It is the cheapest and strongest boiler.

From carefully kept accounts of the cost of labor and material on ıe two boilers, I found the straight-top boiler cost two hundred and inety dollars less than the wagon top, which difference is made up rincipally in the cost of material, as the following table of actual eights will show:

eight of wagon-top boiler (without flues)	12,670 pounds.
eight of straight top boiler (without flues)	11,415 "
Difference	1,255 pounds.
eight of wagon-top boiler (with flues)	17,990 pounds.
eight of straight-top boiler (with flues)	15,935 "
Difference	2,055 pounds.

As to the strength of the straight boiler, you will all acknowledge to be much the stronger form.

Second. The straight boiler, notwithstanding it has much less ating surface than the wagon top, steams equally as well, if not tter, under all circumstances.

The difference in heating surface will be rendered more manifest by the following table:

Heating Surface.	Straight Top.	Wagon Top.
In fire box—above grate and minus sectional area through flues	sq. feet. 99.5	sq. feet. 110.9
In flues—outside diameter	963.4	1144.6
In flues—inside diameter	843.3	1001.5
Total (using external flue surface)	1062.9	1254.96
Total (using internal flue surface)	942.8	1112.4
Area of fire grate	15.6	15.6
Area of fire-grate openings	5.63	5.63
Ratio of grate area to total heating surface (external flue surface)	1 to 68.3	1 to 80.7
Ratio of grate area to total heating surface (internal flue surface)	1 to 60.4	1 to 70.4
Ratio of grate area to sectional area through flues	2.47 to 1	2.1 to 1

The capacity of the boilers is as follows:

	Straight Top.	Wagon Top.
Of the outside shell (with fire box, flues, etc.) in gallons	2,586	2,583
Of the outside shell, (with fire box, flues, etc.) in cubic feet	344.	344.4

Being within four-tenths of a cubic foot, or about three gallons of the same capacity.

The steam and water capacity is as follows:

	Straight Top.	Wagon Top.
Water capacity (with two gauges or 5½ inches above crown) in gallons	1,150	914
Water capacity (with two gauges or 5½ inches above crown) in cubic feet	153.3	121.8
Steam capacity (under same conditions) in cu. feet	47.2	61.8
Total capacity (in working order) in cubic feet	200.5	183.6

As I mentioned before, the wagon-top boiler weighs in material about two thousand pounds more than the straight top, but as the straight top contains two hundred and thirty-six gallons more water in working order, the two boilers are within two hundred pounds in weight of each other in working order.

When these boilers were first constructed, a failure was predicted for the straight top, but when such results as the following manifested themselves these predictions were dropped.

Miles run to the ton of coal by the two engines having these boilers, both being engaged in the same passenger service and hauling trains, averaging ten cars to the train, from October 1, 1879, to May 1st, 1880:

31.11 miles to the ton by wagon top.
31.73 miles to the ton by straight top.

This performance together with that of the smaller boiler previously mentioned, tends to prove that with the character of water in use on Western roads, which, as a rule, is very muddy or very hard, easily forming, scale the boiler with the greatest water circulation and most open crown sheet is the most preferable and economical.

As to the question of material for boilers: We have used steel exclusively for the last five years with marked success, and consider it the best material, all things considered, for locomotive boilers, both for fire box and shell.

I contemplate prosecuting these experiments further during the coming year, and will probably be in a position to give actual results at our next Annual Meeting.

JACOB JOHANN, M. M.

Mr. JOHANN, Toledo, Wabash & Western Railroad—Referring to the miles run per ton of coal, I would say that the running time of these trains is from forty to forty-five miles per hour; and you will observe that there is very little difference in the miles run per ton of coal—it is hardly worth speaking of, and whatever there is the credit belongs to the engineer.

THE PRESIDENT—You have heard the paper read by Mr. Johann; what is your pleasure in regard to it?

Moved and seconded that the paper be received and printed in the Annual Report.

Carried.

THE PRESIDENT—The report of the Chairman of the Committee on Boilers was read yesterday, and made a special order for nine o'clock this morning. This motion was reconsidered, and the paper laid over, to come up with the paper just read by Mr. Johann, on which discussion is now in order.

Mr. JOHANN, Toledo, Wabash & Western Railroad—Mr. President, this matter of boiler construction should certainly be very interesting, and we all know something about it; and I do not think it should be left to one or or two of the Committee to dig up and present this matter to the Association single-handed; but when members are asked for information on this subject, they should be ready to investigate, and return intelligent answers. It is only by an interchange of views that we can arrive at the facts that would otherwise remain unknown. It is with this view that I have presented this paper this morning for your consideration; and, in this connection, permit me to call your attention to an article in the Railroad Gazette, which has some bearing on the method of staying the crown sheet that I adopted in straight-top boiler. It is a good article, and one which I think it would be well for every member to read. The great difficulty with many is as to whether they should rivet the crown stays or use nuts. This is certainly a very important matter, and one that bothered my mind considerably; but I finally came to the conclusion that stay bolts, when properly riveted, are the best; that is, so far my experience goes, I am entirely convinced it gives better satisfaction than using nuts. When you use nuts you increase the amount of metalic substance around the bolt, and thereby start leakage. In regard to heating surface, I have found that boilers badly incrustated and filled with sediment still managed to do their work pretty well, which led me to think we could get along with less heating surface and provide for better water circulation. Upon the subject of boilers generally, I hope members will express themselves freely, for it is really one of the most important subjects that can be brought before us, and as I said before, it is only by an interchange and comparison of views that we can arrive at the facts.

Mr. SIMONDS, Chicago & St. Louis Railroad—I would like to ask Mr. Johann whether, in his opinion, the two boilers were constructed so as to give the practical difference between a wagon top and straight boiler. He has thirty more flues in his wagon top than he has in his straight boiler; and

I find a great many of our builders are giving less heating surface and more water space than formerly, in order to produce a better circulation; and these engines built in this manner have given better results, which fact might prevent a fair comparison between the two types of boilers. My own experience is that we have been putting too many flues in our boilers.

Mr. JOHANN, Toledo, Wabash & Western Railroad—In answer to Mr. Simonds, I would say that I constructed the two boilers relatively the same, for the purpose of testing them under the same conditions as to the heating surface and water space. My object in building the straight-top boiler with thirty less flues was this: I have been of the opinion some time that we were overdoing the matter of heating surface; that is, we were heating more surface than was really necessary. I have found in some cases that my boilers around the crown bars were full of sediment and scale, and not only that, but a large amount of mud in the cylinder part of the boiler, and yet these engines, as a general thing, would make steam enough to run their train without difficulty. You might occasionally hear a complaint from the engineer that his engine did not steam quite as well as when she first came out of the shop, but still they always managed to get along. It was this fact of engines making steam under these circumstances that led me to think we should pay more attention to water circulation. Our boilers will not then be so liable to fill up, for sediment will be more easily removed, and better results will be obtained in every way. I may be mistaken, but I think so, and this is why I constructed these boilers as I have done. I made one of the boilers with wagon top, and put in one hundred and ninety flues, giving five-eighths of an inch water space between them, simply because the majority of Master Mechanics are in favor of more heating surface, which could not be obtained in any other way except in the fire box, and something had to be done to demonstrate the matter. To see if we could not get along with less in the other boiler, I put in one hundred and sixty flues with seven-eighths of an inch space between them, giving two hundred and thirty-six gallons more of water. In this connection I beg to take up a little time of the Convention in reading an article from Mr. Forney's paper, on the subject of large water space, wherein the writer asserts that engineers carry too much water in their boilers, which prevents engines from steaming. Mr. Johann read the article referred to, and continued: Now, Mr. President, it has been my observation that where you have plenty of water there will be no difficulty in making steam. If an engine has a large quantity of hot water she will certainly be able to do more work, when it comes to the pinch, than an engine that is short on water; but some will say that it will take more fuel to heat a larger quantity of water, but I think this will only hold good in firing up, and when once hot you have this heat stored up as a reserve to fall back upon, and this is the point that I have been working on all along. I would be glad if some of the members would step in and assist me. There is something to be learned every day, and I think there should be an improvement in our

boiler construction. There is considerable we can do if we will only put our shoulders to the wheel and do it.

Mr SEDGLEY, Lake Shore & Michigan Southern Railroad—I have been very much interested in this subject of heating surface, and it is my opinion that we have been devoting too much of our space in boilers to that purpose. I think we would better give more and better water circulation and less heating surface. I would like to ask Mr. Johann what was the number of square feet of heating surface in the boilers he experimented with?

Mr. JOHANN, Toledo, Wabash & Western Railroad—The straight fire box had ninety-nine and one half square feet, and the wagon top one hundred and ten and one-tenth square feet.

Mr. W. J. STEEL, Louisville & Nashville & Great Southern Railroad—Mr. President, this question of using stay bolts, instead of crown-bar bolts with nuts, has been discussed quite frequently in the Railroad Gazette, and I am greatly interested in the matter. The experiment was tried on the Louisville & Nashville Road with fifteen new engines. The crown bars were put on with rivets instead of using nuts, but the first engine of this kind that was under my supervision soon gave way. We had the furnace taken out, and found abundant evidence that there was plenty of water over the crown sheet, and it was decided by the superintendent of machinery that crown-bar bolts with nuts were necessary to the safety of the boiler. For my own information I would be glad to hear the opinion of the members upon this point. In the case referred to Mr. Wells and several other prominent railroad men were present when the investigation took place, who took great interest in the matter.

Mr. SETCHEL, Little Miami Railroad—I would like to ask the gentleman if they used crown-bar bolts with nuts, or stay bolts riveted?

Mr. STEEL, Louisville & Nashville & Great Southern Railroad—We now use crown-bar bolts with nuts.

Mr. JOHANN, Wabash & St. Louis Railroad—That is a matter which, of course, it is very well to look into, and there really ought to be some practical tests made to demonstrate the difference. Now, so far as using nuts is concerned, that is simply a matter of opinion with me for I never used any, but from replies made upon this subject to a similar Association in Germany, published in the Railroad Gazette of April 16th, 1880, I beg leave to read the following extract from the report of the Committee:

"With regard to the question, 'which show most favorable results; riveted or screwed stay bolts in the attachment of the crown sheet, and which particular form of each is considered best?' considerable diversity of opinion exists. A large majority of the reports are in favor of a rivet head, particularly on the inner side of the fire box. Rivets are objected to on the ground that they are liable, unless of very soft metal, to be so much strained while being closed in a cold state, as to loosen the thread at the screw end and cause a leak, while where a nut is used at both ends this objection is removed; that it is

difficult to close a rivet securely on the inside, in consequence of the small space to work in; that, in case a nut is burned or broken off, it may be renewed easily, while if the stay bolt is riveted, and the rivet head is burned, a new stay bolt has to be fitted, involving expense and loss of time. Against the nuts it is urged that they are very quickly burned off; one road mentioning an instance where they used brass nuts, which were all burned off in two years, while a set of rivets was good after eight years. In no case have careful experiments been undertaken with a view to determine the respective merits of nuts and rivets under similar treatment and conditions, and, though we may compare the results as expressed in the reports, they do not furnish conclusive arguments on either side. Various combinations of screw and rivet were employed. In many cases, especially where the outer shell of the fire box was round, the stay bolts were riveted outside and furnished with nuts inside the fire box, which method gave entire satisfaction. One or two roads experimented with capsule, or closed nuts, and some with washers under them; but, though both are reported satisfactory, they furnish no grounds for comparison. Both rivet and screw are probably equally valuable when carefully made and adapted to their respective circumstances."

I find myself that men in some cases break the stay bolts in screwing them in by having the stay too large and by using a large wrench, but since I have given particular instruction to the men about screwing them in, and with stay bolts of good material, there is no danger of their giving way, and it is much better than to use nuts.

Mr. BARNETT, Grand Trunk Railroad.—*On our road we have at least ninety engines with riveted crown bolts, and we have no difficulty with them, and we have yet to have the first case of failure.*

Mr. YOUNG, Cleveland, Columbus, Cincinnati and Indianapolis Railroad.—*Mr. President, instead of using the ring stay bolt, we rivet the bolts to the crown sheet, also in the wagon top, using strips of steel plate perhaps two inches wide. We have had no trouble with them so far, and we have now run them two years. The socket of the bolt is, perhaps, seven-eighths of an inch, and we find a great saving in this method.*

Mr. SETCHEL, Little Miami Railroad.—*I would like to ask Mr. Johnson whether he would make any difference in his method of putting in stays on account of the thickness of the sheet. I have examined the letter Mr. Steel refers to, and in that case the material was very light, while it was represented as being one-fourth of an inch. It was but a little over three-sixteenths, and the stays had a very light hold upon the sheet, and were apparently drawn through without much difficulty, and it seems to me that unless three-eighths of an inch or say a thicker crown sheet is used, we need something more than the clinching of the stay bolts to make that sheet secure. One question is to screw a crown bar bolt from the bottom with a thick nut and large head, and a nut on top, and thus give excellent results with us.*

Mr. JOHANN, Wabash & St. Louis Railroad—Mr. Setchel has asked me a question on this subject, in reply to which I would say that in my opinion (of course we are all entitled to an opinion), I think one-fourth of an inch too thin. I do not use them any thinner than three-eighths of an inch, and if they are used any thinner I would not want to be responsible for putting them in. I think it was a year or two ago that the Chairman on Boiler Construction Committee in his report made the recommendation that they ought to be five-sixteenths for side sheets, three-eighths for crown sheets. That was his opinion, and being forced for my opinion, I would say that I never use any thing less than three-eighths in my crown sheets. I set the crown sheets and stay bolts three inches apart, and my crown bars two inches. I screw on the crown bolts from the top, through the sheet, just precisely as I do stay bolts. I never had any trouble with one of these yet, and I have been using this practice for the last six years, and I see no reason to change. The bolts and screws I use are cut by a machine, and, of course, takes but very little labor to construct them. The performance of the engines is entirely satisfactory, and, of course, I am satisfied.

Mr. RAYMOND, Chicago—Mr. President, I do not like to interrupt the the Convention, but the Committee appointed upon the amendment of the By-Laws is now ready to report.

THE PRESIDENT—If we break the thread of discussion it will be difficult to resume the subject.

Mr. RAYMOND, Chicago—It will take but a few minutes to dispose of this question.

On motion, the following report was submitted to the Convention:

Report of the Committee on Amendments to Constitution.

To the American Railway Master Mechanics' Association:

GENTLEMEN—Your Committee to whom was referred a question concerning the methods of the Committee appointed from year to year, upon subjects selected for examination and discusssion, beg leave to report that they have had the same under advisement, and respectfully submit the subjoined amendments to Article V of the Constitution of the Association, with the unanimous recommendation that the same be adopted.

By order of the Committee,

J. H. RAYMOND, *Chairman.*

Amend Article V of the Constitution by adding thereto the following:

SECTION 6th.—At this, the Thirteenth Annual Meeting, the President shall appoint three members to constitute a standing com-

mittee, to recommend to the Association at each Annual Meeting subjects for discussion at each succeeding Convention, one member for three years, one for two years and one for one year, designating the term of each member, and each succeeding year one member of said committee shall be elected by the Association by ballot.

The said committee shall at one o'clock on the second day of each Annual Convention report to the Association subjects for discussion at the succeeding Convention. At seven and a half o'clock of the second day of each Annual Convention there shall be a joint meeting of said committee, with an advisory committee composed of the officers of the Association, which joint committee shall at ten o'clock on the morning of the third day of each Annual Convention nominate to the same the members of the several committees upon said subjects. Said joint committee shall nominate upon subjects which require reports from various parts of the country, full committees of three or five, which committees shall be called Committees of Research, and shall have power to solicit reports from not all, but a part, of the members of the Association upon such subjects; and upon other subjects said joint committee shall nominate simply the chairmen of committees who shall have power to select their own associates upon such committees, which shall be called Committees of Investigation. Said joint committee shall also nominate two associate members to read papers at the succeeding Annual Meeting.

All committees so appointed, whether of research or investigation, shall meet at four o'clock on the afternoon of the third day of each Annual Convention to plan and divide its work for the ensuing year. Each Committee on Research shall on or before the first day of July of each year, send to the Secretary of the Association a circular letter setting forth the character of reports desired from the members, together with a list of the persons to whom said letter shall be sent, and the Secretary shall immediately print and mail same to such members, with an earnest request that as a matter of courtesy full replies thereto shall be sent on or before the first day of April following to the chairmen of such committees. Each committee, whether of research or investigation, shall, if possible, meet pursuant to the call of its chairman, during the second week in April of each year for the preparation of its report, which, in the absence of such meeting shall be prepared by the chairman, and shall immedi-

ately forward the same to the Secretary of the Association, by whom it shall be printed and supplied to the members at the commencement of each Annual Convention. Each report of such committee shall name the members of the Association from whom replies to said circular letters were requested but not received, on or before the first of April as aforesaid.

J. H. RAYMOND,
JOHN ORTTON,
WM. WOODCOCK,
J. M. BOON,
M. N. FORNEY,
S. A. HODGMAN,
F. G. KAUFHOLZ,
} *Committee.*

THE PRESIDENT—You have heard the report of your Committee, what is your pleasure in regard to it?

Mr. SPRAGUE, E. K. Porter & Co.—I move it be accepted.

Mr. RAYMOND, Chicago—In order to bring the matter up for discussion, I move the adoption of the report which, I believe, requires a two-thirds vote. I do not desire to enter into any discussion; but I do think there should be some change in the manner of collecting information, and for the commencement of our investigations during the coming year.

Mr. SPRAGUE—In making motion to accept that Committee's Report, I did not mean the adoption of it. Although I think it is very important that a new departure should be taken in the manner of conducting our investigations, I do not think it ought to be forced on the members without a little consideration. Of course, if the members want to adopt it without discussion it is all right; but I think it would be better if it were discussed properly and fairly, and then decided by a vote, and not let it be done in an arbitrary manner. There is one point I object to, that is to call the Committee together at a certain hour. I would change that and let the Committee meet at any hour that suits their convenience. As it is now, it is too arbitrary, I do not think it is necessary or just that they must meet at a certain hour when they can just as well meet at any time while the Convention is in session. There is another point I object to. I do not see any sense in attaching penalties. If the members do not think it is their duty to answer these circulars that are sent to them now, they certainly will not do it if there is a penalty attached, and for one I do not think it is necessary to add a penalty for that purpose.

Mr. ORTTON, Canada Southern Railroad—I made that objection yesterday to that penalty question. In discussing that subject last night I suggested that instead of sending out circulars the Chairman of Committee upon Subjects would, of his own knowledge, know where to ask for the desired information. He could send out a request to ten or a dozen members, who would

answer a special request for information out of courtesy sooner than if a penalty were attached for not doing so; and they would, in all probability, give more definite and complete answers than if forced to do so through fear of a fine; and I think that would be a great deal better. If you attempt to impose a penalty, the answer will be something like: "No information," "Have had no experience," and we would generally get what would amount to just no information at all. Then the chairman of committee would have to go to work and from these documents make up his report; and if he makes it of any real value to the Association he must spend much more time than if he had depended only on a few well-posted members, by personal application.

Mr. JOHANN, Toledo, Wabash & Western Railroad—It has been my opinion for some years that our investigations are not going on in the way they should, and something ought to be done; but I never had the time or inclination to work out a plan that would be better. If the members will lay aside their prejudice, I think they will see that this resolution which Mr. Raymond has offered is for the best interest of the Association. I am, perhaps, not as conversant with the details of the plan, but I have heard some explanation of it in the committee-room, and on the floor here this morning, and I think it well worthy of a trial. I shall have to differ with my friend Mr. Sprague in regard to the time of meeting being arbitrary; I think that is all right. The time of meeting should be fixed so that members of the committee and all others will know when they meet; and at our Annual Meetings who answers the questions and who do not. So far as the penalty is concerned, I do not think we would gain any thing by inflicting that for non-performance of duty. Any member who will not perform his duty without a penalty would not pay the fine if the penalty were attached; and any member who will not give the Association any information that may be asked for willingly and cheerfully, you might as well let that member go, for he is no honor to the Association. There is no doubt our methods of doing business ought to be better systematized; but I do not think that attaching the proposed penalty for not answering questions will do much in that direction.

Mr. SPRAGUE, E. K. Porter & Co.—I do not think it would be right where members live a long distance from each other, and are appointed to investigate subjects that do not concern their locality, that they should be compelled to attend committee meetings; neither do I think it is right that the committee should be compelled to meet just such a day and hour when they can set the time to suit their convenience better.

Mr. RAYMOND, of Chicago—Mr. President, I only want to say a few words. We meet here for only three days, and we have an immense amount of work to do. I take it for granted that every member of this Association comes here for the purpose of working first, and for having a good time after that if he can consistently with his duties to the Association. We meet from

nine to two o'clock each day, and get through the work in three days, but in my opinion we should have four days; however, the object of the committee is to get the plans and lay out the work for the next year, at any rate, before the first of July, and the results may then be worth something. The members of this committee can get together and consult with one another and lay out their work at once, during recess, and before the Convention adjourns they can tell pretty near how much work they will have. There is more work in the Association than the Supervisory Committee can attend to, and a committee should be appointed to assist in organizing their work as thoroughly as possible before the Association adjourns, and then if any thing remains it can be finished up by the Supervisory Committee.

Mr. SPRAGUE, E. K. Porter & Co.—I do not think there is any one here who has the good of the Association more at heart than I have. I do not claim to be a Master Mechanic, but I have had charge of locomotives, and I claim to know something about them, and, of course, I take an interest in this matter, because I believe that by discussion and investigation we will increase our stock of knowledge in regard to the best manner of constructing and operating locomotives; therefore I want to do the best thing possible to promote its interest, and if the members of the Association favor the adoption of this resolution it can do no harm to try it for a year.

Mr. SETCHEL, Little Miami Railroad—Mr. President, I am in favor of this resolution as a whole, but I notice a clause that seems to me unnecessary, which is this: "Said Joint Committee shall nominate subjects which shall require reports from various parts of the country, full committees from three to five, which committee shall be called Committee of Research, and which shall have power to elicit reports from not all, but a part, of the members." Now, I can not see why this committee should not have the privilege of receiving information from any or all the members of the Association.

Mr. ORTTON, Canada Southern Railroad—I would add, if necessary, all the members.

Mr. RAYMOND, of Chicago—The reason of that clause was to relieve members from the responsibility of answering circulars upon subjects which do not particularly interest them; but instead, these questions will be sent to a few members who have the qualifications and experience to answer them; and if they do not answer or give a good reason for not doing so, then let their names be published in our Annual Report. You can not enforce rules unless you have some penalty.

Mr. SETCHEL, Little Miami Railroad—Then why not make the resolution read: "Such members as they think proper." Now, for instance, Mr. Barnett, of the Grand Trunk Railroad, we all know as a valuable member, who has had a great deal of experience, and can give the committee important information on almost any subject, but he may be one of the "not all members," therefore we are debarred from hearing from Mr. Barnett when he may have the very information we want.

Mr. RAYMOND, of Chicago—Every member to whom the committee will send the papers will have them by the first of July, then he will have nine months to prepare his answer. Last night, in Committee, it was thought that three members on the Committee of Research and five or seven on the Committee of Investigation would be advisable for next year's work.

Mr. JOHANN, Toledo, Wabash & Western Railroad—I can see no serious objection to striking out the paragraph just referred to; if it is left with the committee, they can solicit replies from any of the members they see proper, and if they put the work all on one or two men, let those members defend themselves; but really I think it is time we were making some change in our method of doing business.

Mr. SPRAGUE, E. K. Porter & Co.—So far as I can see, I do not understand that this amendment affects our associate members in any way. What action shall be taken in regard to them?

Mr. RAYMOND, of Chicago—I beg pardon, that clause was omitted. They are to prepare and read papers before the Convention, when called upon to do so by the Supervisory Committee. By consent of the Committee I will insert that now.

Mr. LAUDER, Northern Railroad of New Hampshire—It seems to me we are consuming considerable time in the discussion of this report, and I would move that final action upon it be postponed, and made a special order for to-morrow morning, at nine o'clock, which will give the members an opportunity to talk it over.

Several members objecting to the time, Mr. LAUDER, Northern Railroad of New Hampshire, said: I have no objection to make it one o'clock this afternoon, and the members can confer with one another in regard to it at recess.

Mr. RAYMOND, of Chicago—I do not like to force any thing upon the members that seems arbitrary, but I would like to get this thing through, so as to try it this year, and if you postpone the matter until nine o'clock to-morrow morning we can not do it. I would suggest that unless some member has a reasonable objection that it be set for twelve o'clock.

Mr. LAUDER, Northern Railroad of New Hampshire—I will change my motion to twelve o'clock, and move it be made a special order for that hour.

Mr. ORTTON, Canada Southern Railroad—Does not that interfere with the established usages of the Convention? Is not the hour from twelve to one set apart for the discussion of special questions proposed by the members?

THE PRESIDENT—I do not think it will take up very much time. Mr. Ortton and I think we had better waive the matter and settle this question

Mr. Lauder's motion was then carried.

Mr. SPRAGUE, E. K. Porter & Co.—Mr. President, I believe the Report on Boiler Construction is now in order, and I would move that discussion on that subject now be closed.

Mr. SETCHEL, Little Miami Railroad—Mr. President, in regard to thickness of boiler sheets, I believe there was quite a disposition manifested at the last and previous meetings among the members to reduce the thickness of the sheets to the lowest possible point of safety, and so far as my experience goes where the water is hard they give the best results. This was the reason that I spoke of the necessity of using nuts on crown stays or bolts. Now, within the past few years my experience with one-quarter inch sheets has been very much in their favor. We have two ten-wheel engines with one-quarter inch fire-box side sheets, and they give better satisfaction than any fire boxes we have. They have been burning coal now for over ten years, and they burned wood three years before using coal. They have done excellent service, and it seems to me the thinner we can use our sheets with safety the more durable our fire boxes will be.

Mr. HAYES, Illinois Central Railroad—I agree with our worthy Secretary upon this subject. We are all satisfied the nearer we get the water space to the fire the better results we will get, provided we get strength enough to stand the pressure carried upon our boilers. The man with whom I served my time, Mr. Wymons, of Baltimore, some thirty-five or forty years ago, found where the water was hard and much sediment deposited, that the scale formed on the crown sheets, and sometimes the bolts would become hot and break. We went to work to screw the bolts in, and we would rivet them over, say half or five-eighths of an inch, when we would make new crown sheets, and they would run much longer. We are all well satisfied that thin sheets will run much longer if you can stay them properly. Some roads attempt to use five-eighths for crown sheets, and the consequence is they come down. I believe most roads are using five-sixteenth inch; that is hardly sufficient where you are liable to get this deposit of lime in the water and sulphur in the coal, but where we use nuts we find but little trouble with crown sheets coming down. We make those nuts of the best iron we can get, and the bolts are screwed in from the top. Since this practice has been adopted we have had no trouble; before this was done crown sheets lasted only six, eight or ten months, and now they last four, five, six or seven years, and are then in good order.

Mr. WOODCOCK, Central Railroad of New Jersey—I have found in arched crown sheets, that on the line of the curve, cracks passing almost through the sheet, that would not be visible until the boxes were taken out. These are liable to develop at any time in a way to be exceedingly dangerous and I think it wise to secure crown-bar stays with nuts.

On motion, discussion on the subject was closed.

THE PRESIDENT—The next business in order is the discussion postponed yesterday on the performance of locomotives, with regard chiefly to economy in their operation.

Mr. ORTTON, Canada Southern Railroad—Mr. President, the papers on

this subject were so limited that I think we had better close it, and I would propose that the subject be closed without discussion.

THE PRESIDENT—Do you make that as a motion?

Mr. ORTTON—Yes, sir.

Motion carried.

THE PRESIDENT—The next business in order is the discussion of the report read yesterday previous to our adjournment, on the Best Means of Preventing Smoke from Locomotives, with Due Economy in Fuel. There is quite a number present that were not here yesterday, and perhaps the members would like to have the report read again. It is quite lengthy, twenty-five or thirty pages. Do you desire that it be read again? If not, discussion will be in order.

Mr. KAUFHOLZ, Cleveland, Columbus, Cincinnati & Indianapolis Railroad—Mr. President, I should like to hear the report read again.

Mr. LILLY, of Indianapolis—I move the report be read.

Mr. JOHANN, Wabash & St. Louis Railroad—This is a very interesting subject, and I think it would be well to have the report read again. It will undoubtedly be of benefit to us all, and I would be in favor of taking a standing vote upon the question.

Motion carried, and report read.

THE PRESIDENT—Gentlemen, the report has been received, and discussion is now in order.

Mr. JOHANN, Wabash & St. Louis Railroad—This, it seems to me, is quite an interesting question, and I think the time has arrived when something should be done toward preventing smoke from being such a nuisance. We certainly ought to be able to do something toward it. So far as I am concerned, I replied to the Committee, giving them all my observations of the matter, and I have had considerable experience. I have found the best consumer or preventive of smoke to be the engineer and fireman. They can do more with better results than the best machine you can attach to fire box or smoke stack. Not long ago I went out on the road with my Superintendent, and as we were running along at a pretty lively speed he turned to me and said, "What is the matter with that engine? She makes no smoke at all." I said to him, "The only thing the matter with that engine is the engineer and fireman know their duties, and are attending to them, and that is the reason we have no smoke." There was another instance occurred on the road with which I am connected. Some two years ago a celebrated civil engineer by the name of Smith, who had a high reputation among men of his profession, had occasion to go over the road. I happened to be one of the party, and we had a very pleasant trip on our way until we came to the station where he wanted to get off, which was fifty-four miles out. We had made ten stops, which gave ample opportunity for noticing the amount of smoke thrown out up to this time. Mr. Smith got out and looked all over the engine and train, and remarked to the Superintendent, who was along,

that that was the cleanest ride he ever had behind a coal burner. This was another case of the engineer and fireman's work. I simply state these as illustrations of what the engineer and fireman can do toward preventing smoke, and I say again we can do more to prevent this smoke nuisance by educating the engineer and fireman up to a strict performance of their duties than we can in any other way, at least this has been the result of my observations.

Mr. HAYES, Illinois Central Railroad—After what the Committee have said on this subject, there remains but little room for discussion. The Committee have presented some excellent points in their report, but at the same time have not arrived at perfection, and I think it would be well to let this same Committee be continued another year. They will then get something definite and conclusive, for they are certainly moving in the right direction.

Mr. ORTTON, Canada Southern Railroad—Mr. President, I have one or two words to say on this subject. I have seen nearly all the patentable inventions for consuming smoke before, and also quite a number since I came to this country. I have tried a great many experiments for the prevention of smoke, and the best consumer or preventive that I know of is the engineer and fireman well instructed in the principles of combustion. I do not think any contrivance has ever been invented by which more can be accomplished in any other way; I believe in very long and wide fire boxes, and the fireman should be taught to fire in small quantities, not over two or three shovels full, and that evenly over the grate surface, and not to exceed six inches of fire should be carried at any time. It is impossible with large quantities of coal in the fire box to force air through the grates by the draft through the chimney in sufficient quantities to produce proper combustion. It seems peculiar that in this country we find a necessity to have a petticoat pipe. In England we do not use them, the exhaust pipes run about three inches above the top row of flues, and are very large, which does away with much of the back pressure, and such a thing as smoke and throwing fire is comparatively unknown. Our smoke stacks in this country are something different, and I do not think give as good results. I do not like to be talking about the results produced in the old country, for I know it may not sound very pleasant to many, but I must say I am in favor of following the English practice, and doing away with all the obstructions in the smoke boxes and stacks, and just have a plain stack and high exhaust pipes as I have described. In London, trains run through some of the principal streets, and it is very seldom you see any smoke coming from the stack, and it is very seldom you hear of any property being burned by sparks thrown from the engine. There is a Smoke Inspector, and if he finds any of the railroad companies have engines that smoke, he reports the fact to the Government, and the engineer will be fined five shillings for the first offence, which will be increased for the second offence, and proportionately for the third, and so on, and lose his reputation beside. But strange as it may seem, fines are not

frequent. When I was on the London and North-western Railway I do not know that we ever had a complaint from the Government. I have seen firemen in this country put in shovelfull after shovelfull, and it is no wonder that engines throw smoke. As to a comparison of the load drawn, the English engines usually haul forty-five wagon loads (that is what we call them there), which are equivalent to something like twenty-five loads in this country, and we sometimes haul as many wagons as would be equivalent to twenty-five coaches in this country, carrying from fifty to sixty passengers each. I believe, in order to get rid of a majority of this smoke, we have but to make the changes referred to in our engines and properly educate our engineers and firemen. But as for these patent smoke consumers in my experience I find them a nuisance.

Mr. COOK, Danforth & Cook's Locomotive Works—Mr. President, I would like to ask the gentleman as to the character of the fuel used in the engines referred to which have produced these results?

MR. ORTTON, Canada Southern Railroad—The fuel used is much the same as we have here, the burning of coke has been almost entirely abandoned.

Mr. JOHANN, Wabash & St. Louis Railroad—I move the discussion on the subject be closed, and I would be in favor of referring it back to the same Committee. I think, as has been suggested, another year they will be able to give us some good results.

Mr STEEL, Louisville & Nashville & Great Southern Railroad—Mr. President, this subject is one I have thought about considerable for a number of years. I first became interested in the matter when I was on the Fort Wayne Road a number of years ago, where under one of the best engineers in the country we tried for two years to invent some plan to accomplish the consumption of smoke. We first tried superheated steam, until we arrived at that point where we thought if we could get enameled pipes we would accomplish something in that direction. Well, we got the enameled pipes and experimented with them, but we soon found after repeated trials that the pipes would burn out, and after repeated failures of several plans we abandoned them all, and I believe the conclusions of the Committee on this subject are correct. The larger we can get our boilers, and the less we crowd our exhaust in the smoke stack, the better the results will be.

Mr. RAYMOND, of Chicago—Mr. President, I do not like to break in upon your discussion, but the hour is a little past twelve, which was the time set to bring up the resolution or amendment to the Constitution.

Mr. SPRAGUE, of E. K. Porter & Co.—Mr. President, I understand that the object of taking the action we did was that we might have a recess, and give the members an opportunity to talk the matter over.

THE PRESIDENT—Discussion of the matter under consideration has been continued so that there has been no opportunity to take a recess. If a motion is now made to close this discussion a recess can then be taken, otherwise it will have to come up in its order.

Mr. RAYMOND, of Chicago—Say a recess of five minutes.

THE PRESIDENT—Mr. Raymond, a motion has been made to close the discussion on this subject.

Motion carried.

On motion, a recess of ten minutes was taken.

AFTER RECESS.

THE PRESIDENT—The first business in order is the question on the adoption of the resolution offered by Mr. Raymond.

Mr. JOHANN, Wabash & St. Louis Railroad—One word; I hope the members will understand that this is an amendment to the Constitution, and requires a two-thirds vote for its adoption. As I have said before, it has been my impression for the last four or five years that our method of collecting information was not working satisfactorily, and that some change was necessary, and I believe this resolution offered by our associate member will help this matter, and I hope the members will give it a trial for a year, and vote for its adoption.

Mr. LILLY, of Indianapolis, desired the resolution read again for information.

Resolution read by Mr. Raymond.

Mr. LILLY, of Indianapolis—I do not understand that any thing is said about associate members.

Mr. RAYMOND, of Chicago—Yes; it provides that associate members shall read papers when requested by the Supervisory Committee.

Mr. SPRAGUE, E. K. Porter & Co.—Do you mean to say that the Committee on Subjects, with the Supervisory Committee, which meets on the evening of the second day, are to nominate the associate members to read papers at our next Annual Meeting?

Mr. RAYMOND, of Chicago—Yes, sir.

THE PRESIDENT—The question is on the adoption of the resolution offered by Mr. Raymond.

Vote taken.

THE PRESIDENT—The motion is carried, and the resolution is adopted. The Chair will appoint on that Committee, S. A. Hodgman for one year, Mr. Johann for two years, and Mr. Boon for three years. The hour is considerably past for the proposal of questions for discussion. I think, however, the Secretary has some questions in his hand, which were presented yesterday, and which, if there is no objection, might be read at this time.

The Secretary then read the following question, proposed by Mr. Forney:

"Which is the Best Method of Staying Crown Sheets, with Crown Bars or Stay Bolts?"

THE PRESIDENT—As Mr. Forney is not present to begin this discussion, perhaps we would better take up the next question.

The Secretary then read the fourth question, proposed by Mr. Sedgley, a follows:

"Are Sling Stays from the Crown Bars to the Outside Shell of the Boiler Necessary to hold the Crown and Make the Boiler Safe?"

Mr. SEDGLEY, Lake Shore & Michigan Southern Railroad—Mr. President, the question just proposed is one in which every member of this organization is interested. It really amounts to this: "What is the best method of making our crown sheets secure?" I have never been able to support a crown sheet without putting in sling stays between the crown sheet and the outside shell of the boiler; and where we run engines with a high pressure —say from one hundred and twenty to one hundred and forty pounds per square inch—I think them highly necessary; and where we have used the sling stays we never had a crown sheet come down; and my object in introducing this question was to call out a free expression of opinion from the members as to the necessity of these stays and their method of staying crown sheets.

Mr. LILLY, of Indianapolis—Mr. President, although I am not in the railroad business just now, I have been a Master Mechanic for a great many years, and when I had any of this kind of work to do I almost always used sling stays from the crown bars to the outside shell of the boiler. I know it has not been the practice here but a short time, but it has been the practice in England for twenty-five years, perhaps more than that, and is fast coming into use in this country among locomotive builders. It has been the practice of some to increase the number of crown bars over the crown sheets, and letting the ends rest upon the edge of the side sheet, and then stay from these to the shell of the boiler. I presume it has been the experience of every member that has examined engines with stays put on crown bars in this way that the majority of them get loose and pull off from their places.

Mr. FORNEY, Railroad Gazette—Mr. President, this is a subject I have felt a great deal of interest in, and it is one that is now being discussed very generally on the other side of the water, and I was anxious to have it presented here, to get the opinions of the members in regard to the matter. In my opinion it bears an important relation to the question of boiler explosions. It has been represented by some that have gone so far as to assert that quite a number of our most destructive boiler explosions can be traced to the absence of sling stays, and it would be extremely valuable to us to ascertain if this representation is true. I believe it will be found that there are many Master Mechanics and locomotive builders who will still contend that stays from the crown bars to the outside shell of the boiler are unnecessary. On the other hand, it is maintained by the advocates of them that they serve to secure and strengthen the stay bolts, and prevent the cracking of the sheets at the longitudinal seams. Some time ago I had occasion to look over the reports that are made to the Board of Trade and Parliament of the accidents which have occurred on the railroads in England, in which I noticed

that in nearly all cases of locomotive boiler explosions, where the crown sheets went down, it was attributed to the absence of sling stays. It is the business of the Board of Trade to report upon all railroad accidents, and in the case of boiler explosions, the first thing they do is to appoint a competent expert to represent the Board of Trade, who makes a thorough examination and reports to them. The Board then takes suitable action, and reports to Parliament. Mr. Johann, in his remarks, spoke of using stay bolts running from the outside shell to the crown sheet. That is not the kind to which I refer, but to the stays extending from the crown bars to the outside shell of the boiler. Some months ago there was an explosion of a boiler at Hoboken, which was not supplied with sling stays, a report of which was published in the papers at the time, and there is a great deal of discussion going on now as to the utility of these braces. If they are used, they should be put on in such a way as to not strain the outside shell unduly. In Europe they are using a fire box which they call the Belpre fire box, which has a flat top.

Mr. Forney represented this boiler upon the black-board and gave an interesting statement of the details, and said:

I have written for, and received a complete set of these drawings, which are now in the hands of the engraver, and will soon appear in the Railroad Gazette, so that you will all have an opportunity to see them. I think boiler construction in England is ahead of American practice, and if this is true, we ought to study their system, compare it with ours, and adopt that which is the best.

On motion, discussion on these questions was declared closed.

THE PRESIDENT—The next business in order is the Report of Committee on "The Best Means of Preventing Noise from Safety Valves and maintaining the Safety of Boilers."

Mr. ORTTON, Canada Southern Railroad—I would like to have a committee appointed for taking into consideration the names of candidates for officers to be elected to-morrow, and not leave it until the last moment when every thing is in a hurry.

THE PRESIDENT—Do you make that as a motion?

Mr. ORTTON—Yes, sir.

Motion carried.

THE PRESIDENT—I will appoint on that Committee Mr. Ortton, Mr. Sedgley and Mr. Crockett. If I remember correctly, the Amendment to the Constitution, which has been adopted, requires that the Committee on Subjects shall meet at one o'clock P. M. of the second day's session. The Committee is Mr. Hodgman, Chairman; Mr. Boon and Mr. Johann, members. I would suggest to any members who have questions or subjects they wish to have considered, that they please hand them to the Chairman of the Committee.

Mr. LAUDER, Northern Railroad—Mr. President, I move a committee of

three be appointed to select places to be voted upon for holding our next Annual Meeting.

Motion carried.

THE PRESIDENT—I will appoint on that Committee Mr. Hays, Mr. Eckford and Mr. Coolidge.

The Secretary then read the Report on Safety Valves.

Report of the Committee on the Best Means of Preventing Noise from Safety Valves.

To the American Railway Master Mechanics' Association:

The Committee to whom was referred the question relating to noise caused by steam escaping from safety valves, beg leave to offer the following:

The noise caused by escaping steam can be avoided without danger in two ways: First, by conducting it to the tender and there condensing it. Second, by causing the escaping steam to pass out of the orifices in such a manner as to act on the largest possible amount of atmosphere. There are many simple and cheap devices for accomplishing the above.

GEO. RICHARDS,
W. F. TURREFF, } *Committee.*

[NOTE.—The following report was made by Mr. Howard Fry, a member of the Committee.—SECRETARY.]

To the American Railway Master Mechanics' Association:

It does not seem advisable to your Committee to make a report of the usual kind on the subject submitted to them. The devices are of such a simple nature that no elaborate descriptions or drawings are necessary to describe them, and the results to be obtained are so simple that no extended experiments are needed to determine the value of any given plan. A description, therefore, of the various devices would simply have the value of a catalogue, and, as the plans are patented, it does not seem to your Committee that any useful end would be served by their describing accurately each device, and adding to such descriptions the opinions of various parties as to the relative value of each. Speaking then, simply in general terms, it may be said that the devices prominently before the public for this purpose are of two kinds In the one, the stream of escaping steam is finely separated before reaching the open air, usually by passing

through a chamber and thence to the open air through a number of small holes or fine tubes, or through layers of glass beads. The second method is to prevent the steam escaping into the open air at all, and to convey it by pipe to some large reservoir. In locomotives this is usually the tender. When the first method is applied to safety valves, it is open to the objection that it interferes with the delicacy of the adjustment. It is not merely that it creates a back pressure, but, what is a greater evil, the back pressure is variable in its action, making the valve unreliable.

The second method avoids this trouble, and has the advantage of utilizing some of the heat that is otherwise entirely lost. There is another advantage which, though incidental, is none the less real, and, indeed, forms a very valuable feature. We refer to the heating of the water in the tender. This acts as a decided check on extravagant methods of firing, for, though it is very beneficial to have feed water moderately heated—say less than 120°—a higher heat will give the enginemen great trouble with the injectors. Excessive blowing off of steam will over heat the water, and enginemen, having once experienced this trouble will be more careful of their fire in future. With many enginemen this check alone on reckless firing leads to a surprising economy of fuel. The difficulty of controlling the fire with engines of present construction will also be made apparent to those who design them, and this will probably lead to their engines getting proper ash pans, with tight dampers, so that opening the fire door will not be the sole means in the engineman's power to regulate the fire.

In conclusion, your Committee beg to urge upon the Association the importance of dealing with this question. The noise of escaping steam, especially from safety valves, ought to be regarded as an intolerable nuisance, and a disgrace to those in charge of locomotives. We hope to see the day when engines will be built with sufficient care, and enginemen trained with enough intelligence, to render the application of any special device for hiding the evidence of neglect unnecessary, but at present, we are driven to use such special means for accomplishing the desired end, and in doing so, it is best to hide not only the sound, but the sight of the steam, for both add to the distractions, already too numerous, in railroad working.

HOWARD FRY,
GEO. RICHARDS,
W. F. TURREFF. } *Committee.*

THE PRESIDENT—You have heard the the report of your Committee, what action will you take upon it?

MR. ORTTON, Canada Southern Railroad—I move that it be received with thanks.

Motion carried.

THE PRESIDENT—Discussion upon the report is now in order.

Mr. RICHARDS, Boston & Providence Railroad—Owing to a misunderstanding as to who was Chairman, there was no circular issued by the Committee on the subject of Safety Valves, so that we have got but little information except what comes from the Eastern members of the Committee. Two of the members are present, but Mr. Fry, so far, has not been heard from.

[NOTE.—A paper was afterward received from Mr. Fry, which was read and ordered to be incorporated as a part of the Report of the Committee.—SECRETARY.]

Mr. Richards continued: There are a great many devices in the East, and some, I believe, in the West, for doing away with the noise from safety valves. There are quite a number using the blow-back safety valve. These work well, so far as suppressing the noise is concerned, and with those using them the principal objection is the first cost and the cost of maintaining them. It is also said that where injectors are used the water often becomes so hot that the injectors refuse to work. There are also a great many devices made, called mufflers, in fact there are any number of them. There was one invented by a man in Massachusetts that was a very good device for preventing the noise of escaping steam, which was tried by a number of roads in the East, and found to give pretty fair results. A number of valuable devices have been tried in New York. All of them, I believe, give pretty good satisfaction, the only objection being their first cost. There has been some talk of these mufflers giving good results on Consolidated engines, but what that amounts to I am unable to say, as I received no information whatever except from a few roads in the East, where these engines are not much used.

Mr. ORTTON, Canada Southern Railroad—Have you any recommendation to make as to which is the best device for this purpose?

Mr. RICHARDS, Boston & Providence Railroad—It is not a very easy thing, and perhaps not a very proper thing, for a committee to recommend the best device. Personally I would consider that device that did its work the best was the simplest and the cheapest in construction the best to adopt.

Mr. LAUDER, Northern Railroad of New Hampshire—Have you ever used a muffler called the condensing valve?

Mr. RICHARDS, Boston & Providence Railroad—I believe I have used almost every device that has been seen or heard of in the East. I think the arrangement for conducting steam into the tender is what is called the condensing valve. I saw that used twenty years ago, and the objection to it is,

as I said before, that it heats the water too hot. When the temperature of water gets above ninety or one hundred degrees injectors, as a rule, will not work. There are quite a number of members here from the East who are using the different devices that can, perhaps, give the price. That, however, will depend upon which kind you select. They vary in price from $3 or $4 up to $500.

Mr. KAUFHOLZ, Cleveland, Columbus, Cincinnati & Indianapolis Railroad—Mr. President, I would like to say a word in regard to this matter, I have had some experience with what is called the blow-back valve, which we have had in use on our road for over three years, and we have found them a perfect success. We have not yet had the water so hot in the tank as to prevent the injector or pumps from working, and I have sometimes seen the water pretty hot.

Mr. SETCHEL, Little Miami Railroad—Mr. President, I would like to ask the gentleman how hot his injectors will work the water?

Mr. KAUFHOLZ, Cleveland, Columbus, Cincinnati & Indianapolis Railroad—We have injectors that will work the water very hot. I do not know just what temperature, but about one hundred and twenty degrees at least. We have no trouble with them, and we have all our engines equiped with them; and in ordering new engines we have it put on them.

Mr. COOPER, Lake Erie & Western Railroad—Mr. President, I would like if some gentleman could give us an idea of the price and cost of maintaining these valves.

Mr. KAUFHOLZ, Cleveland, Columbus, Cincinnati & Indianapolis Railroad—I would say that for the three years which we have been using them they have never cost us any thing except the expense of putting them on. We make the pipes of copper or brass, and they do not require renewal or repairs.

Mr. HAYES, Illinois Central Railroad—I would like to ask the gentleman what he pays for the patent; that certainly costs something.

Mr. KAUFHOLZ, Cleveland, Columbus, Cincinnati & Indianapolis Railroad—I do not know any thing about that. I meant, when I said it did not cost any thing, that it did not cost any thing for repairs.

Mr. HAYES, Illinois Central Railroad—The greatest objection I have heard is the enormous royalty asked by the patentee. And then the cost of putting them on is very considerable; and in using them, if engineers and firemen are not very careful the water in the tender will become too hot and cause trouble. It seems to me the best way is to have your safety valves set at the pressure you wish to carry on the engine, and then keep your pressure below that and not allow the valve to blow off. If the engineer and fireman are careful and attentive to duty the valves need not be constantly blowing.

A MEMBER—But when the pressure gets up to that certain point and the engine is still, you can not hinder the valves from blowing.

Mr. HAYES, Illinois Central Railroad—I beg to differ with the gentleman. If your engine has an injector and a blow-off cock all you have to do is to put on the injector and blow off and fill up, and you can prevent your engine from blowing.

Mr. SEDGLEY, Lake Shore & Michigan Southern Railroad—I am very much interested in hearing the report of this Committee, and I was about to ask for some information with regard to the cost. So far as my experience has been, this blow-back valve which has been talked about costs considerable, and that is an important matter with the road I represent. It is important whether we put on a muffler that costs $5 or a blow-back that costs $100, and I am very sorry the Committee did not give us some figures as to the exact cost; and I would like to ask some of the members present what these appliances that have been mentioned cost, whether $50, $100—$150 or $500. I would like to ask Mr Richards if he can not give us this information.

Mr. RICHARDS, Boston & Providence Railroad—We put on one muffler, the cost of which, including royalty, was $20 for each locomotive. We had another that cost $4 for the valve. We do not know who owns the patent. We have still another kind, that costs $25, but there will be no patentee to pay on this. We have still another kind, that costs, including royalty, $60; and we have two other kinds, to be paid for when they prove satisfactory; but as they have never been satisfactory, I do not know that they can claim anything.

Mr. BLACK, Dayton & Michigan Railroad—It seems to me that unless the actual cost can be given these figures will not do any good.

Mr. RICHARDS, Boston & Providence Railroad—Mr. President, I have been trying to approximate to that; but, as I understood it, the question was not the cost, but simply whch was the best.

Mr. LAUDER, Northern Railroad of New Hampshire—It seems to me that the practical question to decide is, which is the most desirable to have—the steam escape through a muffler into the atmosphere, or take it back into the tank, to prevent the noise of escaping steam. I suppose you can get a valve for $10 that will prevent the noise, if that is all that is required; or you can put on the blow-back valve, that will cost five times as much, or more, that will blow the water into the tank, and then I do not know that it is a very good thing to do; you gain nothing by it; you only restore to the boiler the heat you took from it, and if this heating prevents the successful working of the injector it is a detriment to the engine.

Mr. HAYES, Illinois Central Railroad—I move that discussion on this subject be closed.

Carried.

THE PRESIDENT—The next business in order is the Report of your Committee on Shop Tools and Machinery, which is in the hands of the Secretary, but as it is near the hour of adjournment, and the report is quite lengthy, it perhaps would be as well to take up some of our unfinished business. Is the

Committee on the Next Place of Meeting ready to report? Or have the Committee on Correspondence any thing to present?

THE SECRETARY—I have a communication which was handed in by the Committee on Correspondence, who recommend that it be read to the Convention.

THE PRESIDENT—Will the Secretary please read?

The Secretary then read a communication from the International Institute for preserving and protecting weights and measures, asking the co-operation of the Association in opposing the French metric system in this country.

On motion, it was received and filed.

Mr. JOHANN, Wabash & St. Louis Railroad—If there is no other matter to come before the Convention, I would like to report on behalf of the Committee appointed under the Amendent to the Constitution passed this morning, to select subjects for the ensuing year. The Committee, you remember. was required to meet at one o'clock, and we have had but very little time to consider the matter. We, therefore, ask your indulgence, for we have done the best we could for the time allowed us, probably by the next year we will be able to do better.

Report of Committee on Subjects.

To the American Railway Master Mechanics' Association:

List of Subjects for Fourteenth Annual Convention:

1st. Best Means of Producing Better Combustion in the Use of Bituminous Coal.

2nd. Best Form of Construction for Locomotives for Fast Passenger Trains.

3rd. Shop Tools and Machinery for Manufacturing of Locomotives.

THE PRESIDENT—You have heard the report of your Committee, what action will you take in regard to it?

Mr. WOODCOCK, Central Railroad of New Jersey—I move it be received.

Motion carried.

Mr. LAUDER, Northern Railroad—As there seems to be no other business, and our time is about up, I move we now adjourn.

Motion carried.

Convention adjourned to meet at nine o'clock Thursday morning, May 15th.

THIRD DAY'S PROCEEDINGS.

Convention called to order at nine o'clock, A. M., Thursday, May 13th.

THE PRESIDENT—The first business in order this morning is the reading of a paper prepared by Mr. Raymond, of Chicago.

Paper Read by Mr. J. H. Raymond.

Mr. PRESIDENT: It is but just to myself to state that until after the first session of the present Convention I intended to give the principal points to which I shall call your attention in a very informal way, introducing them in cursory remarks at some appropriate point of the pending discussions. Except from the force of the circumstances with which you are familiar, I should not attempt to prepare a formal paper to be presented to this body in less than twenty-four hours.

As may reasonably be expected, on account of the nature of my official duties, what I shall submit pertains to the *patent relations* of the improvements which either are already in use or are worthy of being introduced.

To fully appreciate the difficulties under which we labor in the premises, and in order to act understandingly in attempting to solve these difficulties, it is necessary first to know what are the penalties for infringing patent rights.

There are two methods of estimating the amount of such penalties: One, which has obtained now for about three-quarters of a century, applies, as a rule, only to actions at law; and the second, a monstrous colature of the courts, which is of more recent growth, applies, as a rule, only in actions in equity. The former is based upon the alleged damages of the plaintiff, and is measured by the license fee, if one shall have been established by the sale of licenses under the patent; and the latter is based upon the alleged profits or savings of the user, and is, as a rule, measured by the theories of paid experts and astute attorneys.

Infringements of patents may be committed by either making, selling, or using the process or thing patented, and the measure of

recovery differs accordingly. The maker is responsible for the license fee; the vendor is responsible for the profits derived from the sale, if such profits exceed the amount of the license fee, and if not, then for the amount of the license fee; and the user is responsible for whatever can be proved by expert testimony, which can be bought to order by the cord, the defendant has made or saved by the use of the invention.

On occasions of this character, a single illustration is worth a mile of theory. Let us take, therefore, the case of the Williams burner for head-lights, which is just at this time engaging the attention of the whole fraternity.

In 1859, Mr. Williams, a pioneer in the business, takes seven old elements and combines them to make what is alleged to be a new and patentable combination in burners for locomotive head-lights.

In 1865, he reissues his patent, and obtains fifteen technical claims for different combinations of these seven elements. In an equity suit, under the reissue, against the Rome, Watertown & Ogdensburg Railroad Company, which involved head-lights furnished by all the prominent manufacturers, the court held that each of the head-lights was an infringement of three or more of these technical claims. The suit was, in fact, defended by one of the manufacturers, the Adams & Westlake Manufacturing Company, which recognized its equitable obligation to the railroad company. Not only the savings which applied to the railroad company, but also the profits which applied to the manufacturer and vendor, were proved up. Concerning the former, the master found that the combination of these seven elements produced the first head-light which was capable of burning kerosene oil, and ascertaining the variations and differences in and between the prices of kerosene and lard oil during the five years involved in this suit, he found that the savings of the railroad company on account of the use of the alleged invention was *three hundred and thirty dollars per head-light.* This calculation extended to all the railroad companies during the life of this patent makes a liability on this account alone of between *seven and eight million dollars.*

Concerning the manufacturer's profit, the master found that the cost of manufacturing was two dollars per burner, and the market

value of the article, as proved by the plaintiff's business, was about thirteen dollars per burner, and the manufacturer's profit, *i. e.*, the plaintiff's damages, were eleven dollars per head-light. This calculation extended as before makes a liability from this stand-point of about one hundred and seventy-six thousand dollars. Add to the above the facts that the decree of the Circuit Court against the Chicago & Northwestern Railway Company, in the Tanner brake case, when extended as above, amounted to over *sixty million dollars*, and that the Circuit Court once decreed five railroad companies defendant to pay over *one million seven hundred thousand dollars* for the use of the Swage block in mending rails, and we have enough to show not only the wickedness of these rules and the importance of these matters, but also that not only those who have these matters particularly in charge, but also the heads of the various departments, who, as a rule, incur this liability for the railroad companies, should have an anxious and constant care in this regard.

I am aware that if the respective members of this Association want a head-light they order it of the purchasing agent, who, as an assistant to the general manager, makes the purchase. But in the amount of the liability incurred for the railroad companies your share, gentlemen, has in the past been greater than that of any other officer, unless it be the master car-builder.

Again, let us take one or two illustrations, and first that of transparencies in head-lights. Mr. A puts a transparency in the side of a head-light to show the number of the train, and cuts a hole in the side of the reflector for a supply of light. Mr. B ascertains that he can get a sufficient supply of light through the chimney-hole in the reflector, and raises the transparency up and preserves the reflector intact. If the latter improvement was made by a Master Mechanic, in nine cases out of ten, under the practice which has heretofore prevailed (but which, I hope, is at an end), he would not patent it. But in the illustration we have taken, both arrangements are the subject of letters patent. The owner of the latter patent, Mr. B, presents it to a Master Mechanic, and he sees in it a full drawing and specification of the arrangement and a claim which covers it, and without a thought as to whether this arrangement involved the idea of Mr. A, and is, therefore, an infringement of Mr. A's patent, the device is introduced.

This illustration is used to show you also how one patent (Mr. B's) may be perfectly valid, and yet may infringe another patent (Mr. A's) upon which it is an improvement.

Take another illustration: Mr. John Doe, a Master Mechanic, desirous of improving the construction and operation of his locomotives, sees, on a locomotive of a connecting road, the simple yet valuable piston-packing patented to Mr. H. D. Dunbar. If he gives it a thought at all in this connection, he supposes, on account of its simplicity, and the slightness—if I may so say—of the differences between it and that which has long been in use, that it can not be made the subject of letters patent, and adopts it only to awake up years after when claims are made under the outrageous rules of recovery which we have briefly considered.

Again referring to Hopkins' lead-lined bearings, the head of a department who has used a Babbit metal since, say 1852, and *has full knowledge of the Hopkins patent* says to himself: "To be sure the old metal did not give the *full* results of adjustment between the journal and the bearing which the softer lining gives, but the difference in the proportions of the metals used in the compound are so slight that it does not involve any invention, and this is, to my mind, one of the very many instances of a foolish issuance from the patent office of a monopoly upon a slight and insignificant change." The new compound or combination is introduced, and the head of the department wakes up years after to a suspicion that perhaps he made a mistake—perhaps he was not competent to pass upon that question.

It is no manner of a reflection upon the members of this Association to say that they are not competent to pass upon any one of the many patent questions which arise with every single change you make in any of the devices or processes in use, no matter how slight the change may be, but that in every instance these questions should be referred IN ADVANCE to those skilled and experienced in the practice and study of the patent law—that is, either to the Western or the Eastern Associations, or to counsel specially employed for this purpose.

With one more thought and two illustrations I leave this part of the subject. In 1871, Mr. Thomas Gorman, then of the Wabash Railway, showed to a traveling rascal an improvement which he had

made, but which he freely gave to his Company and to the public without patenting it. A few years after, being in the office of a manufacturer in Boston, he met this man trying to sell a license under a patent which he had obtained upon this identical improvement. But for this accident, and for the further accident that Mr. Gorman knew his duties well enough to acquaint our Association (the Western) with the facts, we should be forced now, if claim were made, to advise the railroad company to pay for nearly ten years use of this improvement.

Again, early in 1878, Mr. Johann devised and introduced on to the same road an improvement which I judge to be of considerable value. I was informed on yesterday that this month a certain advertising sheet published in New York professedly in the interest of science, contains an illustration or advertisement of this same device as being the patent property of another.

The present thought is that in any changes or improvements which involve enough of utility to warrant their being made, you should consult the proper authority to ascertain if the same be patentable, and if yea, then for the protection of your employers you should apply for letters patent therefor.

An unwritten rule of the Western Railroad Association which I am trying to develop into an established custom, is that the several companies shall pay the expenses of all such applications for patents by its employes and shall receive from the inventor in return a full license to use the invention, the inventor to retain the title to the invention for all other roads. This course is incumbent upon the railroad companies not only for the purpose of self protection, but also for the purpose of encouraging inventions and improvements upon which progress in the true science of railroading primarily depends.

The closing subject of the present paper, namely, the relations as to patent royalties of manufacturers and supply agents on the one hand, and railroad companies on the other, is more appropriate to managers and purchasing agents yet not inappropriate on this occasion.

The facts which should determine these relations differ widely in different cases. The locomotive swing trucks, for which heavy royalties were paid by the railroad companies of the West, were introduced in some instances by the locomotive builders without any ad-

vice or instructions from the railroad companies; in other instances by the locomotive builders pursuant to special specifications of the railroad companies, and in still other instances by the Master Mechanics in rebuilding or repairing trucks and locomotives. I am glad to be able to say that as far as my experience has gone, all the locomotive builders, with one notable exception, have in this and in all other cases refunded to the railroad companies the royalties paid on account of infringements committed by the railroad companies, by the use of devices furnished by the builders without advice or special instructions from companies.

A month or so since we were informed by the owners of the Friedman injector that they had obtained, in a well-contested suit, a decree sustaining the validity of the Gresham patent upon a supplemental jet of steam discharged into the overflow pipe, for the purpose of producing a vacuum and starting the injector, and finding the Little Giant injector to be an infringement thereof. The Associations were not consulted until after a considerable number of the infringing injectors had been introduced and the above decree obtained. We then said to the manufacturers of the Little Giant injector, you have gotten us into this difficulty, you must get us out of it, and to the owners of the Gresham patent, if you can obtain a reasonable settlement from the manufacturers you must take same, and in such settlement relieve the railroad companies from all liability for the past. Both parties responded, and the matter was adjusted accordingly.

The plan which I am now pursuing is as follows: If the railroad company orders of the builder a locomotive, specifying among other things, say, the Dunbar Piston Packing, the builder may take it for granted that the company has the right to use that packing, and if any claim is subsequently made therefor, the company should pay the cost of settling or defending the claim, according as to whether it appears to be well founded, and in all respects bear the full responsibility of its own act. But if the builder, without any specifications from the company as to the kind of truck to be used other than that it shall be in accordance with the builders standard, and he without asking the advice or instructions of the company, and entirely on his own motion, furnishes say the Jewell or the Smith swing truck, and the company shall feel forced on account of the arbitrary and onerous provisions of the patent law to make settlement therefor,

the builder should reimburse the company in full therefor, and the representatives of the company will be justified in using every means in their power, both legal and commercial, to force the builder to acknowledge and act in accordance with his equitable obligation in this regard.

The manufacturer has at all times the privilege of obtaining through the company from the Associations advice as to these patent relations, and thus measureably, if not entirely, escape the responsibility involved. The manufacturer of an injector, making a specialty of that which forms, say one thousandth part of the devices and tools used by railroad companies, is better qualified, and therefore the more bound to be mindful of and to thoroughly investigate, *in advance*, the possible liability attaching to the use thereof. In my opinion the maxim *caveat emptor* does not apply to these cases, and no honest criticism can be made to the equity of the propositions thus laid down.

The means by which this practice will be carried out are found primarily in the commercial relations between the manufacturers and supply agents and their customers, although all controversies of this kind will be avoided if the manufacturers and supply agents will either live up to their obligation in this regard, or will show that the obligations as thus laid down do not rest upon them.

The conclusions, therefore, gentlemen, which I would print in permanent colors and large letters at the top of the tressel boards of every railway mechanical shop, and which should govern the daily actions of King Solomon, Hiram Abiff and the humblest apprentice alike, are:

1. Have an anxious and constant regard for these patent questions which constantly arise in your daily duties.

2. Bear in mind that only those skilled and experienced in the practice and study of the patent law are competent to pass upon the simplest of the questions of validity and infringement which we have been discussing.

3. Never introduce any change in the appliances or process now in use without ascertaining from the proper authority whether the same has been patented or is patentable, and also how many and what patent the use of the improvement would infringe.

4. If it or any part of it is patentable, make application at once for a patent therefor, and

5. Patronize, encourage and favor only those manufacturers and supply agents who recognize and live up to their obligations to protect your companies fully in the use of that which they furnish.

Mr. RAYMOND, of Chicago—I have had men come to my office with patent valves, to whom I have had to say: "We can not use your device." But they say: "You say it is valuable, and will no doubt give satisfaction." "Very true; your patent is a valuable one." And the man starts in to give you a solution of his claim upon the invention; and you find he has an element of somebody else's device that he has improved which has answered his purpose to obtain a patent which we can not use without infringement. I make these remarks to show that the rule of the Association should be that no member should adopt any patent, however trifling, in the mechanical department without first submitting the same to the Eastern or Western Railroad Association, and ascertaining what the patent liability may be first, instead of waiting until the patent is adopted and liability for damage is incurred. I do not wish to appear to underrate the value of this Association, but I do say that patent liability is a question which no Master Mechanic can decide for himself. It is a question whether the builders of locomotives using a patent that is an infringement upon the invention of some one else are liable for the damages of such infringement, or the railroad companies that are using the locomotives. I have consulted a great many good lawyers upon that point, and some are on one side and some on the other; but I would also say that where locomotive builders are shown that they are responsible for putting on these patents that are infringements upon the rights of other parties, the majority of them pay for such infringement, which relieves the railroad company of any responsibility in the matter, although there is one large establishment in this country that has been called upon to settle these infringements, from whom as yet we have never been able to get any thing.

Mr. SPRAGUE, E. K. Porter & Co.—I would like to ask Mr. Raymond if locomotive builders are not willingly using patents which they know at the time are infringements? I do not think this should escape our notice. Although he said it was some large locomotive establishment, I do not think he alluded to us, as we are not, and do not claim to be, a very large locomotive establishment. But I would say that if there is any device upon our engines that is an infringement upon any one's patent, we protect our customers against damages; and it seems to me that builders have no right, willingly or unwillingly, to refuse. We have no right to make our customers pay the expense of royalty on patents on manufactured goods.

Mr. RAYMOND, of Chicago—Mr. President, I would say, in justice to Mr. Sprague, that the manufacturing company which he represents have in all

cases paid the cost of infringement, when it was proven to them that they were liable.

THE PRESIDENT—You have heard the paper as read by our associate member, Mr. Raymond; what action will you take in the matter?

Mr. WOODCOCK, Central Railroad of New Jersey—I move it be received and printed in our Annual Report.

Mr. SPRAGUE, E. K. Porter & Co.—I would like to add that a vote of thanks be tendered our associate member, Mr. Raymond. I do not know that many of the Master Mechanics have had the trouble in their experience in the matter Mr. Raymond has been talking to us about that I have; but I fully agree with him as to the importance of every Master Mechanic understanding the impositions of this patent business; and I think every Master Mechanic should be glad to get all the information he can in regard to it. I, for one, have been very much interested in the paper, and I think it will benefit all to heed his advice.

Mr. LAUDER, Northern Railroad of New Hampshire—I am in favor of the motion as made by Mr. Sprague, and I hope it will pass.

Motion carried.

THE PRESIDENT—The next business in order, according to the amendment to our Constitution adopted yesterday, is the Report of the Joint Committee on Subjects and Committees, for ten o'clock this morning.

The Secretary read the report as follows:

Committees and Subjects for Discussion at the Fourteenth Annual Convention.

To the American Railway Master Mechanics' Association:

GENTLEMEN—The Joint Committee, formed under Article V of the Constitution, repectfully beg leave to report the following arrangement of Subjects and Committees for the ensuing year:

1.

Subject and Committees of Research.

Boiler Construction and Improvement.

R. WELLS, L. & N. Road,
S. J. HAYES, Illinois Central,
C. R. PEDDLE, T., H. & I. Road,
JACOB JOHANN, Wabash & St. Louis,
JAMES ECKFORD, Cin., Ham. & Dayton.

2.

Subjects of Investigation.

Best Means of Producing a Better Combustion in the Use of Bituminous Coal.

JAMES BOON, *Chairman.*

3.

The Best Form of Construction of Locomotives for Fast Passenger Trains.

W. WOODCOCK, *Chairman.*

4.

Shop Tools and Machinery for the Manufacturing of Locomotives.

H. N. SPRAGUE, *Chairman.*

A. L. Holley, of New York, and John W. Hill, of Cincinnati, associate members, have been selected to prepare papers to be read at the next Annual Meeting. Respectfully,

By Order of the Committee.

J. H. SETCHEL, *Secretary Joint Committee.*

THE PRESIDENT—You have heard the Report of your Committee, what is you pleasure in regard to it?

Mr. HAYES, Illinois Central Railroad—I move it be received.

Mr. LAUDER, Northern Railroad of New Hampshire—I notice that there are only four subjects presented for investigation during the coming year, one of research, three of investigation, and two papers to be read by associate members, and it seems to me that these will not make sufficient business for our usual three day's session; I think that we should have had one or more subjects added for Committees of Research. I simply make this as a suggestion for the consideration of the Convention. The Supervisory Committee can be instructed by a vote of the Convention to add one or more subjects, or the Convention itself can select them as they see fit.

Mr. SPRAGUE, E. K. Porter & Co.—Mr. President, I think there should be five subjects at least to be discussed at our next Annual Meeting, but I know of none that I could suggest that would be of sufficient interest to occupy the time of the Association, and I agree with Mr. Lauder that there should be one or two more subjects for committee investigation.

Mr. JOHANN, Wabash & St. Louis Railroad—I see no objection to adding another subject, but I beg to differ with Mr. Lauder in regard to the question of material for discussion at the next Annual Meeting. My opinion is that if the subjects are properly worked up by the members doing their part, there will be more business than we can get along with at our next Annual Meeting; but, as I said before, there is no objection to another subject. The greatest difficulty that I have noticed heretofore has been that the subject has not been worked up as it should be, and the only reason for it is that the majority of the members do not help the committees. If the members will only go to work upon the four subjects they will certainly be found of sufficient importance and interest to occupy the entire time of our three day's deliberations.

THE PRESIDENT—You have heard the report of your Committee, what action will you take upon it?

On motion of Mr. Hayes, of the Illinois Central Railroad, the report was received.

THE PRESIDENT—A Committee should be appointed on Resolutions, and in order to give them a little time, it might be well to appoint them now, before the reading of the next report.

Mr. SETCHEL, Little Miami Railroad—I move that a Committee on Resolutions be appointed.

Motion carried.

THE PRESIDENT—I will appoint on that Committee Mr. Forney, Mr. Sedgley and Mr. Woodcock.

THE SECRETARY—There were only two members of the Committee on Safety Valves present in Convention yesterday, but at a late hour last evening I received a communication from the other member, Mr. Fry, and I would move

that it be read and included with the papers of the other members of the Committee, by whom it has been examined, and at whose suggestion I make the motion.

Mr. JOHANN, Wabash & St. Louis Railroad—I second the motion.

Motion carried.

The Secretary then read the paper referred to. See page 75.

THE PRESIDENT—The next business in order is the Report of the Committee on Shop Tools and Machinery. The report is in the hands of the Secretary who will please read it.

The Secretary then read the report as follows:

Report of Committee on Tools and Machinery.

To the American Railway Master Mechanics' Association:

GENTLEMEN: Your Committee on Tools and Machinery beg to submit the following report, not so much as a contribution to knowledge or of little known facts, but as a statement likely to call for discussion, and thus give our successors next year (for we hope our little success will not discourage), some broad and general idea of the special matters to which they are expected to give their attention.

Description of the Flue Cutting and Scarfing Machine, Designed and Built by J. Johann, M. M.

The method which I employ of piecing flues is by brazing, and as the old methods of cutting and scarfing required considerable time and labor, it became desirable to have a machine designed to perform this work specially.

The accompanying "blue print" is a representation of the machine which was built for this purpose, and which has been in use for two years, giving entire satisfaction.

It consists of a plain box stand, having a cast-iron head, movable around a central pivot. This head supports a stepped pulley and hollow spindle through which the flue is passed and held by means of a three-jawed chuck.

When cutting off flues the head is placed central and bolted down by means of side bolts. When scarfing it is turned to the right or left according as the scarf is to be on the outside of the flue (Fig. 1) or inside of the flue piece (Fig. 2).

After scarfing the flue piece the tool is pressed up against the edge, when a shoulder on the tool turns the edge over as shown in Fig. 3. The flue and piece are then pressed into each other, when it is ready for the brazing wire. The advantages of this machine are:

First. In the rapidity with which the work may be performed.

Second. It secures a perfect joint and a straight flue.

Third. In permitting the use of cheaper labor, as it is so simple a boy can and does tend it.

Fourth. Its capability of performing other work when fitted with a different chuck.

Very truly yours,

JACOB JOHANN, M. M.

SLIDE BAR GRINDING AND TRUEING MACHINE.

The lower part of this tool resembles a small planing machine, its narrow traveling bed is hollow or dished, has pinching screws at sides to hold the slide bar, and is partially filled with water to keep the bar cool.

On the upper portion of the fixed frame is mounted a dry emery or buffing wheel, six or seven inches broad, having a slow side traverse as well as a quick revolving motion. A broad leather or rubber apron is attached to each end of the traveling bed (falling over carrying rollers at ends of the fixed frame), to keep the V slides of the machine free from grit and dust.

Its work is highly finished on the wearing surface, true and free from winding, and a single-bar machine will turn out from eight to ten slides per day, or barely one per hour. A man could attend to more than one such tool if required.

FLEXIBLE SHAFT.

This needs no description; a No. 6 with twist drills will be found of great service in the repair and erecting shop, but its greatest utility is found to be in the boiler shop, where the power of a No. 8 is required for tapping holes and screwing in stay bolts.

The use of long screwed stays is rapidly taking the place of crown bars on fire boxes, and an ordinary "Mogul" will require one hundred and eighty such crown stays. The tapping of both crown

sheets at the same time in position, by hand, occupies one man forty-five hours, whereas with the assistance of the flexible shaft the long unhandy tap can be passed through at a uniformly steady speed, making a cleaner, truer thread in eighteen hours.

These taps—in themselves expensive tools—will also have a longer life.

To tap the four sides of a Mogul fire box by manual labor will occupy sixty hours, and to put the screwed stays in from fifteen to twenty more, whereas with the assistance of the shaft both can be done and the work finished in twenty-one hours.

Perhaps a better way of contrasting the economy of its adoption in the boiler shop is that the contract price for labor on new fire boxes for old eight-wheeled engines is reduced $25, simply by allowing workmen to have the use of the shaft.

It should be understood that in entering screwed stays, the shaft can pass them through the first plate until they reach the second, but if they are the tight fit they should be, the work of passing them through the second plate has to be done by hand. The totals before given includes this finishing by hand.

MOLDING MACHINE.

If, as often happens when the rolling stock is reduced to standard, castings are daily being made from one pattern, a molding machine will reduce the cost of labor to a low figure.

Its construction is simple: A stout cast-iron plate is mounted on trunnions, with half of pattern standing out in relief on each side of this reversible plate, which is also provided with pins to temporarily secure the molding flasks down to plate.

It is but a boy's work to put the flask in place, cotter up, dust, fill and ram sand in a rough, rapid way, strike off all loose sand from the flask, swing the plate over so that the flask comes to underside, by foot-lever lift a light lower table up to flask, uncotter, and by same foot-lever lower the separated flask and half mold to the level of floor, whence it is removed to any part of the shop.

The same operation is then gone through with the second flask on what is now the upper side of plate, with the other half of pattern, and the two flasks are then cottered together.

You see its advantages are no skilled labor is required, and the daily production per machine is enormously large.

The flasks must be made to gauge, as they have to be freely interchangeable and yet fit square and true. One pair of stout carrying frames for a machine may, of course, be arranged for a number or series of trunnioned plates having half patterns in relief on each side.

Perhaps it is in the brass foundry, making journal bearings for car axles, that its value will best be realized.

PORTABLE POWER.

An excellent way of getting over the difficulty often experienced in working portable cylinder boring and facing machines, valve-face planers, etc., in erecting and repair shops, by power, without moving the locomotives about, is by running a one-inch steam pipe down or across the whole shop, having T connections and taps at each engine stall, and using a portable engine, which by flexible tube can take its supply of steam from the inch pipe at the T.

Engines of the steam hammer type, suitable for this work, are made weighing but one hundred pounds (without the fly-wheel, which is a separate piece); thus they are readily removed from one point to another, where required, and are ready for use at once.

MACHINES FOR SMITH'S SHOP.

For cutting bar, angle, or T iron (either hot or cold), a quick-moving circular saw (driven by small independent engine, if the shafting is not near) is the cheapest and readiest means.

In addition to this service, a thoughtful workman, by fully utilizing this saw, will save much fine smith's work and slotting machine work. So useful is it found to be that shops having once introduced it wonder how ever they got along without it.

It is believed that smithing too close to finished sizes is over-expensive compared to its absolute value, it being better to use stiff machine tools and take off heavy shavings in finishing. This being open to question, it might be a good subject for next year's Committee to give their attention.

Elliptic and other plate springs now form a large account in rail-

and steam ports on cylinders can be done by using a milling the end of drill spindle of a radial drilling machine.
roperly guide it, a thick template, with slots through it cor- ling to the ports, is bolted to the valve-seat face. A side itted to traverse these slots, and having central hole for drill insures the correctness of the work, as to size and line.
an apparatus can be used where the small amount of new r work will not justify a separate slotting machine specially or this duty, which will finish the corners square instead of as is done by the milling tool.
would suggest as material for the consideration of next year's ttee :

relative value of smithing close to sizes.

highest economical speed in feet per minute of surface cut our y shop tools can be run.

able riveting machines.

a hemp rope as a substitute for ordinary leather belting.

ial adaptations of milling tools for locomotive purposes (illus- by complete drawings of the cutting tools and the finished and giving the cost or time required to do the work.

J. DAVIS BARNETT,
Chairman of Committee.

PRESIDENT—You have heard the report of your Committee; what ill you take in regard to it?
LAYES, Illinois Central Railroad—I move it be received.
n carried.
OHANN, Wabash & St. Louis Railroad—I would offer the suggestion drawings accompanying that report will be published with our An- ceedings, which will be more satisfactory than to make a detailed tion at this time.
PRESIDENT—Any discussion upon the subject is in order.
l that the subject be closed.
PRESIDENT—If there is no desire to discuss the subject, I will put on.
n carried.
ORNEY, Railroad Gazette—Mr. President, if it is in order I would e to offer a resolution at this time.
being granted, Mr. Forney said: Some two years ago the Car

Builders' Association adopted a standard journal bearing for journal boxes and pedestals. At the time this was adopted they prepared a lithograph of the journal bearing and boxes which has been used as the standard for making the patterns for the boxes. A short time ago in looking over this lithograph I found the drawings were very imperfect; I, therefore, proposed to make a separate drawing and have it engraved and published so that it could be made and used by every car builder and master mechanic in the country. In order to be quite certain that the original lithograph was correct, I procured a duplicate of the original pattern from which the drawing was made, and on taking that and comparing it with the original lithograph I found they did not agree, that is; there were smaller dimensions in some cases, and larger dimensions in others, and the whole drawing was full of fractional dimensions, such as 64½ and a $\frac{1}{32}$; and, taking it altogether, it was very unsatisfactory notwithstanding it has been given to a number of car builders and master mechanics to make their patterns from. At the meeting of the Master Car Builders' Association last year, I talked with a number of the members and master mechanics in regard to the matter, and they were of the opinion that the whole subject should be referred to a committee. There are many master car builders and master mechanics that are of the opinion that the journal boxes are not the best that could be adopted, I therefore offer the following resolution:

"*Resolved*, That a committee of five be appointed to confer with a similar committee of the Master Car Builders' Association to consider the subject of a standard car bearing journal-box and pedestal, and report whether any change is desirable from the standard already recommended by that Association."

Mr. SPRAGUE, E. K. Porter & Co—Mr. President, as Mr. Forney was in a great deal of trouble before the standard journal was adopted, and still seems to be in trouble, I feel disposed to help him out, I therefore second the adoption of the resolution.

Mr. FORNEY, Railroad Gazette—Mr. President, in reply to Mr. Sprague I would only say that I expect to be in trouble as long as I have any thing to do with master car builders and master mechanics.

THE PRESIDENT—You have heard the resolution as read by Mr. Forney, what is your pleasure in regard to it?

Mr. ORTTON, Canada Southern Railroad—Mr. President, I desire to say that I have had some trouble with my boxes, and I think, as Mr. Forney says, that the matter should have some consideration, and I rise to second the motion, as I believe it is necessary for a motion to appoint a committee.

Mr. FORNEY, Railroad Gazette—I moved the adoption of the resolution which provides for a committee, and Mr. Sprague seconded the motion.

THE PRESIDENT—As the matter now stands a resolution has been offered

by Mr. Forney, and seconded by Mr. Sprague to appoint a committee to confer with a similar committee from the Master Car Builders in regard to the necessity of a change in the standard journal-box bearings. What is your pleasure in regard to it?

Motion carried.

The President appointed the following Committee: Mr. Forney, Mr Sedgley, Mr. Boon, Mr. Cooper, and Mr. Hudson.

Mr. FORNEY, Railroad Gazette—Mr. Chairman, I wish to make a few remarks upon the subject of the uniformity of screw threads. The question of screw threads is one that has been considerably agitated for a number of years, and is one that is worthy of our attention. I wish to state to the Association that those who have been looking into this matter find that the screw threads manufactured in this country differ very materially, and at a meeting of manufacturers called to consider this subject, it was found that the difference was so great they could do nothing with it; but during the past year another meeting has been called in New York, when the fact developed that a number of the leading lines were moving to adopt a standard. After a great deal of talk without coming to any conclusion, the whole matter was turned over to Mr. Sellers. This included the choice of taps and dies, to be made by the manufacturers, they knowing that unless a good brand was adopted it would be hard to introduce it. Mr. Sellers now proposes that the whole subject shall be reduced to a standard system, so that if we have any interchange of taps and dies, or more properly screw threads, it can be done without much difficulty. This subject has been before the car builders for several years, and it is highly important that we unite on some standard that can be used by all roads.

Mr. SPRAGUE, E. K. Porter & Co.—I would like to ask Mr. Forney if all manufacturers are not agreed as to the number of threads to the inch? I know they were not two years ago.

Mr. FORNEY, Railroad Gazette—No, sir; they are not at present. If you aim to get the threads exactly right, you know very well you will have a great deal of difficulty if there be only a difference of one-thousandth part of an inch, which may be owing to the variation in the shrinkage of material.

THE PRESIDENT—The Secretary has in his possession a paper prepared by Professor Charles A. Smith, which the Committee on Correspondence recommend to be read.

THE SECRETARY—Mr. President, I would just say that at the suggestion of the Supervisory Committee I wrote to two or three of our associate members and asked them to prepare papers to be read before this meeting, and this paper is in response to that invitation, and I presume, therefore, should rightfully be considered a paper proper to be brought before us without any action being taken.

THE PRESIDENT—The Secretary will please read.

The Secretary then read the paper, as follows:

An Experiment on the Change of Temperature of Steam during its stay in the Cylinder of an Engine.

To the American Railway Master Mechanics' Association:

GENTLEMEN—I am induced to transmit to this Association this record of an experiment made through the kindness of Mr. Warren, in the hope of interesting others in a subject which may become of more practical importance than it may seem at the present time.

That steam of different pressures has also different temperatures is too well known to need any comment, but the rapidity with which change of temperature follows change of pressure is perhaps less clearly appreciated.

It was first shown experimentally by Mr. G. B. Dixwell, of Boston, that in ordinary engine cylinders the temperature of the steam changed during every stroke, and that very important consequences followed therefrom. The instrument used by Mr. Dixwell consisted of a delicate metal pyrometer, devised by him and placed in a groove cut on the inner face of the cylinder head.

The instrument used in the experiment to be described is presumed to be less sensitive than that used by Mr. Dixwell—the results being no less interesting on that account but perhaps of less value than if one of his instruments had been used. [Mr. Dixwell's experiments are mentioned by him in a paper read before the Society of Arts, in Boston, on April 29th and May 13th, 1875,]

The instrument used by the writer consisted of a silver tube six inches long, five-sixteenths of an inch external diameter, and one thirty-second of an inch thick. This tube was exposed to steam from the cylinder on the outer surface only, and when expanded by a rise of temperature gave a motion to the index of an ordinary pressure-gauge by means of cam and toothed gearing moved by a rod fastened to the tube at one end and passing through it. The graduation was obtained by direct comparison with a good thermometer.

When this instrument is attached to the cylinder of an engine moving slowly, the index shows nearly the whole change of temperature to be expected from the tables of the properties of steam (125° for 120 pounds of steam, for example), but at higher speeds the movement grows less.

On the 24th April, 1880, the instrument was placed on the front

end of the left cylinder of engine No. 11, running train No. 3, on what is known as the Cairo Short Line (St. L., A. & T. H., B. & S. I. Div.). The train was a light passenger train, and the engine ran throttled, except at the highest speed, which was made on an up grade for a few minutes.

The changes of temperature were watched for thirty-three miles with the same results.

At	50	revolutions	per	minute.	..... 120°	Fah.	change.
"	100	"	"	"	..... 60°	"	"
"	200	"	"	"	..... 30°	"	"
"	300	"	"	"	..... 20°	"	"

From the above notes certain conclusions might be drawn, but the only one which the writer has confidence in is that a very large loss of heat takes place up the stack by radiation into the exhaust steam from the heated surface inside the cylinders—by no means a novel conclusion, however.

It would appear that at high speeds this loss is constant for time only, and is not dependent on the speed; while, as the power exerted varies with the speed, the proportion so lost is greater at low speed and less at high speed. The beautiful simplicity of this inference may be entirely due to lack of delicacy in the instrument used, but it is rendered probable by the fact that the hot metal of the cylinder is open to the exhaust half the time at all speeds, and may lose the same amount of heat thereby.

Some very alarming computations can be made as to the amount of heat lost in this way, by assuming the iron surface to act at the same rate as the silver surface; but we have no right to make such an assumption, and we will therefore refrain from the figures. It is, however, the intention to repeat the experiment with iron surfaces in place of silver, thereby hoping to obtain reliable data for such computation, and when the magnitude of this evil is established in your minds some remedy therefor may be obtained.

Respectfully, CHAS. A. SMITH.

THE PRESIDENT—You have heard the paper of Mr. Smith; what action will you take upon it?

Mr. SPRAGUE, E. K. Porter & Co.—I move it be received and published in our Annual Report.

Carried.

THE PRESIDENT—There was a Committee appointed yesterday to select

candidates for offices for the ensuing year; is that Committee ready to report?

Mr. Ortton, Canada Southern Railroad, Chairman of Committee, made the following report.

Report of Committee on the Nomination of Officers.

To the American Railway Master Mechanics' Association:

GENTLEMEN—The Committee Appointed to Nominate Officers report the following names as candidates for the different offices:

FOR PRESIDENT—N. E. Chapman, J. N. Lauder, Jacob Johann.

FOR FIRST VICE-PRESIDENT—W. S. Hudson, Reuben Wells, M. M. Pendleton.

FOR SECOND VICE-PRESIDENT—J. Davis Barnett, H. L. Cooper, S. A. Hodgman.

FOR TREASURER—S. J. Hayes.

FOR SECRETARY—J. H. Setchel.

JOHN ORTTON,
JAS. SEDLEY,
J. F. CROCKETT, } *Committee.*

THE PRESIDENT—You have heard the report of your Committee, what is your pleasure in regard to it?

Mr. JOHANN, Wabash & St. Louis Railroad—Before any action is taken on that report I beg to decline to have my name come before the Convention for the office mentioned. I am very much obliged to the members for their kindness, but I positively decline to be a candidate. I prefer to be on the floor, and I beg to have my name struck off from the list.

Mr. FORNEY, Railroad Gazette—I move appointment of two tellers to count the vote.

THE PRESIDENT—The report of the Committee has not yet been received, Mr. Forney; gentlemen, you have heard the report of your Committee, what action do you wish to take upon it?

On motion, the report was accepted.

Mr. LAUDER, Northern Railroad of New Hampshire—I would move that the report be referred back to the Committee for amendment.

Mr. ORTTON, Canada Southern Railroad—I think Mr. Lauder's motion to recommit the report to the Committee is unnecessary. Mr. Johann has positively declined to serve as a candidate, and, of course, we can and should receive his resignation.

Mr. LAUDER, Northern Railroad of New Hampshire—Perhaps it would be well for me to make a statement of my position in regard to my motion. My reason for making the motion was that the name of our honored First Vice-President, Reuben R. Wells, might be added to the list of candidates for President. He is a man whom I honor and esteem as one of the most

valuable members of our Association, and Iam very sorry he is not with us this year, but I think his name should be presented as a candidate for the position of President. I believe he should head the list for the reason that the position belongs to him, and I greatly wish the Committee had so presented it.

Mr. JOHANN, Wabash & St. Louis Railroad—I would move that the name of Mr. Wells be added to the report.

Mr. BLACK, Dayton & Michigan Railroad—I second the motion.

Mr. LAUDER, Northern Railroad of New Hampshire—By consent I withdraw my motion and accept that of Mr. Johann, to add the name of Mr. Wells to the list of candidates for President.

Mr. Hayes, Illinois Central Railroad, also seconded Mr. Johann's motion.

THE PRESIDENT—You have heard the motion of Mr. Johann to add the name of Mr. Wells to the list of candidates for President.

Mr. SPRAGUE, E. K. Porter & Co.—I wish to say a word before this question is put. I can readily see why the Committee did not put Mr. Wells' name on that report. Mr. Wells is not with us this year, and I understand it is a question whether he can be next year, as he has accepted an important position on another line of road which will occupy the greater part of his time. I regard Mr. Wells as highly as any member here, but I think it is inexpedient for this Association to select a President that is not present and is not likely to be another year.

Mr. LAUDER, Northern Railroad of New Hampshire—I can not agree with the remark of my friend Mr. Sprague; whatever may be the cause that Mr. Wells is not with us this year it does not follow that he will not be in future. I think I know Mr. Wells well enough to say that although he may have under his control the machinery department of a vast system of roads, he will have time to do full justice to the Association if you see proper to make him President.

Mr. SPRAGUE, E. K. Porter & Co.—I think I know Mr. Wells well enough to say that he would not favor electing a man President when it was not known whether he could serve or not, and I know that if he thought that the interest of this Association could be better served by electing one of the members present for President, he would certainly wish his name withdrawn. When I know that Mr. Wells will and can accept my position, I shall be very glad to vote for him, but under the circumstances I think it is to the interest of the Association to withdraw the claims of Mr. Wells to the Presidency.

Mr. JOHANN, Wabash & St. Louis Railroad—I know that it is very creditable to us that our officers are worthy of being retained a long time in their positions. I do not know how others feel about the matter, but I think the time has come when we should make a change, and as we are about to do so, I hope the name of our friend Mr. Wells will be presented as a candidate for the Presidency. Mr. Wells has been for a long time one of the most valuable members of the Association, and if elected will do just as he always

has done, and render the Association all the aid in his power. I was present at the election of our first President, which took place thirteen years ago in this city. He was then in charge of the Cincinnati, Indianapolis & Lafayette Road, and was considered a Western man. In a few years he changed to a more important position on another road, and has not since had the pleasure of meeting with us. Mr. Chapman, of the Cleveland & Pittsburgh Road, was elected his successor, which was very proper, but he was also a Western man. Now, I think in making a change we should have candidates representing all sections of the country, to show that there is no sectional feeling in the matter. We will then have Mr. Chapman from the West, Mr. Wells from the South, and Mr. Lauder from the East, and the members can take their choice and vote for whom they please, and I hope Mr. Lauder will not object to having his name come before the Association. If he is defeated, he will, of course, accept it gracefully, and try it again some other time.

Mr. ORTTON, Canada Southern Railroad—Gentlemen, I desire to call your attention to the fact that Mr. Chapman requested the Committee not to present his name as a candidate before the Association for the office of President. He took special pains to make this request, but the Committee thought it was only justice that his name should be presented, and we feel if he is elected that he will yield to our wishes and accept the office cheerfully.

THE PRESIDENT—The question is on adding Mr. Wells' name to the list of candidates for President.

Motion carried.

On motion of Mr. Forney, of the Railroad Gazette, Mr. Turreff and Mr. Steel were appointed tellers.

THE PRESIDENT—The election of officers is now in order; gentlemen will please prepare to ballot for the office of President.

Mr. FORNEY, Railroad Gazette—I desire to call the attention of the Association to the fact that we are furnished with tissue ballots, and this election should be carefully watched. [Laughter.]

Balloting was then proceeded with, which resulted in the election of Mr. J. N. Lauder, of the Northern Railroad of New Hampshire, for President.

On motion of Mr. Black the election was made unanimous.

Mr. LAUDER, Northern Railroad of New Hampshire—Gentlemen, I feel highly complimented and flattered by this election to the office of President of this Association. I have only this to say, it was unexpected, and I have no speech to make, but I will use my best endeavors with all the ability I possess to make myself worthy of the confidence you have reposed in me by electing me to this office. [Applause.]

THE PRESIDENT—The next business in order, gentlemen, is the election of the First Vice-President.

Mr. SPRAGUE, E. K. Porter & Co.—Mr. President, will the Secretary please read the names of the candidates for First Vice-President?

The Secretary read the names.

Mr. SPRAGUE, E. K. Porter & Co.—I move that the name of Mr. Wells be added to the list of candidates for First Vice-President.

Mr. RAYMOND, of Chicago—I move as a substitute for that motion that the Secretary be instructed to cast the ballot of the Convention in favor of Mr. Reuben Wells for First Vice-President.

Motion carried.

THE PRESIDENT—The Secretary will please proceed to carry out the order of the Convention.

THE SECRETARY—Mr. President and gentlemen of the Association, obeying your instructions, I have now the pleasure of casting the united ballot of this Association for one who since its first organization has labored faithfully and honestly for its highest and best interests; a man that has never faltered or complained when asked to assume important responsibilities, and has by his ability and mechanical genius given us the ablest reports on the most difficult questions that has been our privilege to investigate. I refer to our honored First Vice-President, Mr. Reuben R. Wells.

This announcement met with loud applause.

THE PRESIDENT—I have the pleasure to announce that Reuben R. Wells has been unanimously elected First Vice-President for the ensuing year. The next business in order is the election of a Second Vice-President. The Secretary will please read the names.

THE PRESIDENT—Gentlemen, you have heard the names of the candidates, please prepare your ballots for the election of a Second Vice-President.

Voting was then proceeded with, which resulted in the election of J. Davis Barnett for the office of Second Vice-President.

THE PRESIDENT—I have the pleasure of announcing that Mr. J. Davis Barnett has been elected to the office of Second Vice-President of this Association for the ensuing year.

Mr. SPRAGUE, E. K. Porter & Co.—Mr. President, I move the election of the Secretary and Treasurer be postponed for one year.

Motion carried.

Mr. ORTTON, Canada Southern Railroad—Mr. President, I rise to make a motion that this Association tender to the retiring President, by a rising vote, our sincere thanks for the able manner in which he has presided over our deliberations.

Mr. RAYMOND, of Chicago—Gentlemen, I think we owe to our retiring President something more substantial, and I move as a substitute that a committee be appointed to draft suitable resolutions expressing our appreciation of Mr. Chapman as our President, to be forwarded to the Secretary, and printed in the proceedings of this Convention.

President Lauder put the question, and the motion was carried unanimously.

President Lauder appointed Mr. Raymond, Mr. Sedgley and Mr. Johann Committee.

PRESIDENT CHAPMAN—Gentlemen, I thank you heartily for this renewed expression of good will which you have given me. I have been connected with the Association since its formation, now thirteen years, and in all my intercourse with you I have had but one object in view, and that is the welfare of the Association.

The following is the report of the foregoing Committee:

Resolutions of Committee in Regard to President N. E. Chapman.

MR. J. H. SETCHEL, *Secretary American Railway Master Mechanics' Association:*

DEAR SIR—Concerning the refusal of Brother N. E. Chapman, to accept a re-election as President of the Association, the Committee appointed for that purpose desire to spread the following upon the records and proceedings:

Gratituous services should always be properly acknowledged, but should be spoken of the more heartily when they are given in positions of labor and trust without emolument, and solely for the good of the fellows of such an Association as ours.

We recognize that Brother Chapman has discharged faithfully and acceptably the duties of President of this Association for three years with purely unselfish motives, with perfect courtesy to all, without personal controversy of any kind, and with a devoted purpose to promote the objects of the Associaton, to lay out its work wisely and well, to clothe the conduct of the executive part of its work with economy, efficiency and kindness, and to conduct its annual deliberations with dignity, and with impartiality and benefit to all its members.

All this he has accomplished, as the improvement of the character and usefulness of the Association during recent years witnesses, in a measure which demands, as it has received, both the gratitude and the admiration of the entire membership.

J. H. RAYMOND,
JAMES SEDGLEY,
JACOB JOHANN,
} *Committee.*

PRESIDENT LAUDER—By request of President Chapman I will endeavor to preside over your further deliberations. Is either the Committee on the Place of Next Annual Meeting or Resolutions ready to report?

Mr. FORNEY, Railroad Gazette—The Committee on Resolutions are ready to report.

Report of Committee on Resolutions.

To the American Railway Master Mechanics' Association:

The Committee appointed to draft resolutions would report as follows:

They recommend that the thanks of this Association be extended to Rev. Dr. Charles Pomeroy, Mayor Herrick, the Board of Trade of Cleveland, the Cleveland Rolling Mill Company, the Union Screw Steel Works, the Chisholm Steel Shovel Works, the Otis Iron and Steel Works, the Standard Oil Company Works, the Cleveland & Pittsburgh Railroad Company, the proprietor of the Kennard House, the members of the Press, the Committee of Arrangements and other citizens of Cleveland for the services they have rendered, and the hospitalities extended to the members of this Association during their stay in this beautiful city.

M. N. FORNEY,
JAMES SEDGLEY,
A. R. McALPINE,
} *Committee.*

THE PRESIDENT—Gentlemen, the question is on the adoption of the resolutions just read.

On motion, the resolutions were adopted.

Mr SEDGLEY, Lake Shore & Michigan Southern Railroad—Mr. President, it has been our custom to vote a suitable sum for our worthy Secretary, and I move that $600 be paid him for his services during the past year.

Motion carried.

THE PRESIDENT—I would say that the Committee to select names for the place of our next Annual Meeting have reported Pittsburgh, New York City and Providence, Rhode Island.

Mr. HAYES, Illinois Central Railroad—In order to save time I move that we take a standing vote.

Mr. STRAGUE, E. K. Porter & Co.—It is now just our time for taking a recess, and I would suggest that we have one in order that the members may talk the matter over.

THE PRESIDENT—If there is no objection, a recess of ten minutes will be taken.

AFTER RECESS.

THE PRESIDENT—The first business in order is the election of a place for holding our next Annual Meeting. Will the members please be seated that we may take a rising vote?

THE SECRETARY—We can select the place better and quicker, and I

think more satisfactorily, by ballot, the same as we elect officers, and I would be in favor of doing it that way.

Mr. JOHANN, Wabash & St. Louis Railroad—I think the suggestion of the Secretary is probably the best way to dispose of this question; the place getting the lowest number of ballots can be dropped each time, and that will settle the matter in a few minutes. We need not have to exceed two ballots.

On motion, this plan was adopted.

THE PRESIDENT—I will appoint the same tellers that we had on the election of officers, Mr. Tureff and Mr. Steel.

The vote was proceeded with until the President announced the polls closed, and directed the tellers to count the vote.

THE SECRETARY—Mr. President, the whole number of votes cast is forty-two, necessary to a choice twenty-two; New York has received fifteen, Providence nineteen, Pittsburgh seven, scattering one.

PRESIDENT LAUDER—There is no choice. Gentlemen, please prepare your ballots for another vote. Under the rule the name of Pittsburgh will be dropped from the list.

Vote being taken, the President announced the polls closed, and directed the tellers to count the vote.

THE SECRETARY—Mr. President, the whole number of votes cast is forty-two, necessary to a choice twenty-two; New York has received fourteen, and Providence twenty-eight.

Mr. BLACK, Dayton & Michigan Railroad—Mr. President, I move the selection of Providence as the place of holding our next Annual Meeting be made unanimous.

Motion carried.

THE PRESIDENT—Gentlemen, you will please come to order and listen to the report of the Finance Committee.

Mr. Richards, the Chairman of Committee, reported a collection of $255.

PRESIDENT LAUDER—You have heard the report of your Committee, what action will you take in regard to the matter?

Moved that the report be received.

Motion carried.

THE PRESIDENT—Is there any further business to come before the Association?

Mr. WOODCOCK, Central Railroad of New Jersey—If there is no further business I move we now adjourn.

THE PRESIDENT—Association stands adjourned to meet in PROVIDENCE, RHODE ISLAND, on the SECOND TUESDAY in MAY, 1881.

J. H. SETCHEL, *Secretary.*

List of Committees and Subjects for Discussion at the Next Annual Meeting.

1.

Committee of Research.

Improvements in Boiler Construction.

R. WELLS, Louisville & Nashville;
S. J. HAYES, Illinois Central;
C. R. PEDDLE, Terre Haute & Indianapolis;
JACOB JOHANN, Wabash & St. Louis;
JAMES ECKFORD, Cin. Ham. & Dayton.

2.

Subjects for Investigation.

Best Means of Producing Better Combustion in the Use of Bituminous Coal as a Fuel for Locomotives

JAMES BOON, *Chairman.*

3.

Best Form of Construction of Locomotives for Fast Passenger Trains.

W. WOODCOCK, *Chairman.*

4.

Shop Tools and Machinery for the Manufacture of Locomotives.

H. N. SPRAGUE, *Chairman.*

Associate Members Appointed to Read Papers.

A. L. HOLLEY, New York;
JOHN W. HILL, Cincinnati.

Standing Committees on Subjects.

JAMES M. BOON,	. . . . .	3 years.
JACOB JOHANN,	. . . . .	2 "
S. A. HODGMAN,	. . . . .	1 "

Trustees Boston Fund, Printing and General Supervisory Committee.

J. N. LAUDER, Northern of New Hampshire;
R. WELLS, Louisville & Nashville;
J. DAVIS BARNETT, Grand Trunk;
S. J. HAYES, Illinois Central;
J. H. SETCHEL, Little Miami.

Arrangements for Next Annual Meeting.

J. H. ANDERSON, New York, Boston & Providence;
GEORGE RICHARDS, Boston & Providence;
J. K. TAYLOR, Old Colony & Newport.

CONSTITUTION,

As Amended at the Sixth Annual Meeting, Baltimore, May 13, 1873.

PREAMBLE.

We, the undersigned Railway Master Mechanics, believe that the interests of the Companies by whom we are employed may be advanced by the organization of an association which shall enable us to exchange information upon the many important questions connected with our business. To this end do we establish the following

CONSTITUTION.

ARTICLE I.

SECTION 1. The name and style of this Association shall be the AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.

ARTICLE II.

SEC. 1. The officers of the Association shall be a President, a First and Second Vice-President, a Secretary, and a Treasurer.

SEC. 2. The above-named officers shall be elected separately, by ballot, at a regular meeting, and a majority of all votes cast shall be necessary to a choice.

SEC. 3. The officers shall be elected for a term of one year, but in the event of the election being postponed shall continue in office until their successors shall be elected.

SEC. 4. Two tellers shall be appointed by the President to conduct the election and report the result.

ARTICLE III.

SEC. 1. It shall be the duty of the President to preside in the usual manner at all the meetings of the Association, and approve all bills against the Association for payment by the Treasurer.

SEC. 2. It shall be the duty of the Vice-Presidents, according to rank, to perform the duties of the President in his absence from the meetings of the Association.

SEC. 3. In case of the absence of both President and Vice-Presidents, the members present shall elect a President *pro tempore.*

SEC. 4. It shall be the duty of the Secretary to keep a full and correct record of all transactions at the meetings of the Association; to keep a record of the names and places of residence of all members of the Association, and the name of the road they each represent; to receive and keep an account of all money paid to the Association, and at the close of each meeting deliver the same to the Treasurer, taking his receipt for the amount; to receive from the Treasurer all paid bills, giving him a receipted statement of the same.

SEC. 5. It shall be the duty of the Treasurer to receive all money from the Secretary belonging to the Association; to receive all bills against the Association, and pay the same, after having the approval of the President; to deliver all paid bills to the Secretary at the close of each meeting, taking a receipted statement of the same; to keep an accurate book account of all transactions pertaining to his office.

ARTICLE IV.

SEC. 1. The following persons may become members of the Association by signing the Constitution, or authorizing the President or Secretary of the Association to sign for them, and pay the initiation fee of one dollar: Any person having charge of the Mechanical Department of a Railway known as "Superintendents," or "Master Mechanics," or "General Foremen," the names of the latter being presented by their superior officers for membership, also two Mechanical Engineers, or the representative of each Locomotive Establishment in America.

SEC. 2. Civil and Mechanical Engineers, and others whose qualifications and experience might be valuable to the Association, may become Associate Members by being recommended by three active members. Their names shall then be referred to a committee, which shall report to the Association on their fitness for such membership. Applicants to be elected by ballot at any regular meeting of the Association, and five dissenting votes shall reject. The number of Associate Members shall not exceed twenty. Associate Members shall be entitled to all the privileges of active members excepting that of voting.

SEC. 3. Any person who has been or may be duly qualified and signs, or causes to be signed, the Constitution, as member of the Association, remains as such until his resignation may be voluntarily tendered.

SEC. 4. All members of the Association will be liable for such dues as may be necessary to assess to defray the expenses of the Association, and any member who shall be two years in arrears for annual dues shall have his name stricken from the roll, and be duly notified of the same by the Secretary.

ARTICLE V.

SEC. 1. The regular meeting of the Association shall be held annually on the second Tuesday in May.

SEC. 2. Regular meetings shall be held at such place as may be determined upon by a majority of the members present at the previous meeting.

SEC. 3. An adjourned meeting may be held at any time and place that a majority of the members present at any meeting may elect.

SEC. 4. The regular hours of sessions shall be from 9 o'clock A. M. to 2 o'clock P. M.

SEC. 5. During the business sessions no communications shall be received or acted upon other than those pertaining to the business of the Association.

SEC. 6. At this, the Thirteenth Annual Meeting, the President shall appoint three members to constitute a standing committee to recommend to the Association at each Annual Meeting subjects for discussion at each succeeding Convention, one member for three years, one for two years, and one for one year, designating the term of each member, and each succeeding year one member of said committee shall be elected by the Association by ballot.

The said committee shall, at one o'clock on the second day of each Annual Convention, report to the Association subjects for discussion at the succeeding Convention.

At 7:30 o'clock of the second day of each Annual Convention there shall be a joint meeting of said committee with an advisory committee, composed of the officers of the Association, which joint committee shall, at ten o'clock on the morning of the third day of each Annual Convention, nominate to the Association the members of the several committees upon said subjects. Said joint committee shall nominate, upon subjects which require reports, from various parts of the country, full committees of three or five, which committees shall be called committees of research, and shall have power to solicit reports from not all but a part of the members of the Association upon such subjects; and upon other subjects, said joint committee shall nominate simply the chairman of committees, who shall have power to select their own associates upon such committees, which shall be called committees of investigation; said joint committee shall also nominate two associate members to read papers at the succeeding Annual Meeting.

All committees so appointed, whether of research or investigation, shall meet at four o'clock on the afternoon of the third day of each Annual Convention to plan and divide its work for the ensuing year.

Each committee on research shall, on or before the first day of July of each year, send to the Secretary of the Association a circular letter setting forth the character of reports desired from the members, together with a list of persons to whom said letter shall be sent; and the Secretary shall immediately print and mail the same to such members, with an earnest request that, as a matter of courtesy, full replies thereto shall be sent on or before the first day of April following, to the chairman of such committees.

Each committee, whether of research or of investigation, shall, if possible, meet pursuant to the call of its chairman, during the second week in April

of each year, for the preparation of its report, which, in the absence of such meeting, shall be prepared by the chairman, and shall immediately forward the same to the Secretary of the Association, by whom it shall be printed and supplied to the members at the commencement of each Annual Convention.

Each report of such committees shall name the members of the Association from whom replies to said circular letters were requested but not received, on or before the first of April as aforesaid.

ARTICLE VI.

SEC. 1. This Constitution may be amended at any regular meeting of the Association by two-thirds vote of the members present.

Resolution Passed at the Sixth Annual Meeting, Baltimore, Maryland, May, 1878.

Resolved, That no expense shall be incurred by committees except by the unanimous consent of the General Supervisory Committee, given in writing to the Chairman of said Committee, stating the amount to be expended.

Resolution on Boston Fund, Passed at the Eighth Annual Meeting, New York, May, 1875.

Resolved, That the Boston Fund, amounting now, with accrued interest, to $3,620, be invested in Government securities to be selected by the duly appointed Trustees, and not to be disturbed for the purpose of expenditure unless authorized by the majority of members present in open Convention, and then only after due notice of a motion to expend the same has been given at the session immediately preceding; and that the interest accumulating shall every year be invested in the same manner as the principal, and a full account of the same be duly reported with other financial statements.

Resolution Adopted at the Ninth Annual Meeting.

Resolved, That members of the Association who have been in good standing for a period of not less than five years, and who through age or other cause cease to be actively engaged in the mechanical departments of railroad service, may, upon the unanimous vote of the Association, be elected "Honorary Members," who shall have their dues remitted and be entitled to all the privileges of regular members except that of voting.

NAMES AND ADDRESS OF MEMBERS.

NAME.	ROAD.	ADDRESS.
Anderson, H.	147 Randolph street	Chicago, Ill.
Anderson, J. H	N. Y. B. & P. Rd	Providence, R. I.
Anderson, R. H.	G. & C. Rd	Helena, S. C.
Anderson, Thos	C., C. & A. Rd	Columbia, S. C.
Alden, H. A.	C., C. & B. & O. Rd	Brockville, Ont., Can.
Britton, H. M.	N. Y. & N. E. Rd	Boston, Mass.
Britton, A. W.		Boston, Mass.
Boon, J. M	P., Ft. W. & C. Rd	Fort Wayne, Ind.
Bushnell, R. W	B., C. & R. N. Rd.	Cedar Rapids, Iowa.
Brastow, L. C.	L. & S. Rd	Ashley, Pa.
Boyden, G. E	N. Y. & N. E. Rd	Boston, Mass.
Brooks, H. G	Brooks Locomotive Works	Dunkirk, N. Y.
Barnett, J. Davis	Grand Trunk Rd	Montreal, Canada.
Black, John	D. & M. Rd	Lima, Ohio.
Blackwell, K	Grand Trunk Rd	Belleville Sta., Can.
Blackall, R. C.	D. & H. C. Co	Albany, N. Y.
Baldwin, B. L.	P. & R. Rd	Danville, Ill.
Bissett, John	C. & D. Rd	Florence, S. C.
Briggs, R. H	M. & O. Rd	Whistler, Ala.
Chapman, N. E	C. & P. Rd	Cleveland, Ohio.
Chapman, J. W	N. Y., L. E. & W. Rd.	Hornellsville, N. Y.
Chapman, Thos. L.	C. & O. Rd.	Huntington, W. Va.
Cummings, S. M.		Boston, Mass.
Coolidge, G. A	Fitchburg Rd.	Charlestown, Mass.
Clark, David	L. V. Rd.	Hazleton, Pa.
Clark, Peter	N. Rd. of Canada.	Toronto, Canada.
Cooper, H. L	L., E. & W. Rd	Lafayette, Ind.
Cook, James	Danforth & Cook's Locomotive Works	Paterson, N. J.
Cushing, George	M., K. & T. Rd	Sedalia, Mo.
Crockett, Jno. F.	B., L. & N Rd	Boston, Mass.
Cory, Chas. H.	S. V. Rd.	Portsmouth, Ohio.
Coon, Geo. F.	M. R. Rd	Hancock, Mich.
Colburn, Robert.	N. & W. Rd	Norwich, Conn.
Clifford, J. G	I. M. Rd	Paris, Ill.
Crowell, Nathan	L. & O. Rd.	Peru, S. A.

NAME.	ROAD.	ADDRESS.
Cook, John S	Georgia Rd	Augusta, Ga.
Cook, Allen	C. & E. I. Rd	Danville, Ill.
Devine, J. F	W. & W. Rd	Wilmington, N. C.
Dripps, W. A	3324 Walnut street	Philadelphia, Pa.
Elliott, Henry		St. Louis, Mo.
Edams, J. B.	I. C. Rd	Amboy, Ill.
Ellis, J. C	Schenectady Locomotive Works,	Schenectady, N. Y.
Ellis, W. H	P. & R. Rd	Catawissa, Pa.
Everson, Thos	St. L., S. & L. Rd	Steeleville, Mo.
Eckford, Jas	C., H. & D. Rd	Cincinnati, Ohio.
Foss, J. M	C. V. Rd	St. Albans, Vt.
Fry, Howard	P. & E. Rd	Williamsport, Pa.
Flynn, J. H	W. & A. Rd	Atlanta, Ga.
Fuller, William	N. Y., P. & O. Rd	Cleveland, Ohio.
Fafies, H. V	A. T. & S. F. Rd	Topeka, Kansas.
Finlay, L	C. & F. Rd	Little Rock, Ark.
Foster, W. A	W. & M. Div. F. Rd	Fitchburg, Mass.
Fowle, I. W	C., C., C. & I. Rd	Delaware, Ohio.
Gordon, H. D	P., W. & B. Rd	Wilmington, Del.
Graham, Chas	L. & B. Rd	Kingston, Pa.
Grant, R. D	M. P. Rd	St. Louis, Mo.
Granger, W. E	A. & N. E. Rd	Springfield, Mass.
Gilson, Gregg D	Capiopa Rd	Chili, S. A.
Gordon, James T	Concord Rd	Concord, N. H.
Hayes, S. J	Ill. Cent. Rd	Chicago, Ill.
Hill, E. O	N. Y., L. E. & W. Rd	New York City.
Holloway, J. W.	C., Mt. V. & D. Rd	Akron, Ohio.
Hain, F. K	Elevated Rd	New York City.
Ham, C. T	Buffalo Steam Gauge Co	Rochester, N. Y.
Hudson, W. S	Rogers Locomotive Works	Paterson, N. J.
Hewitt, John	M. P. Rd	St. Louis, Mo.
Haynes, O. A	St. L. & I. M. Rd	Carondelet, Mo.
Hollister, C. W	Valley Rd	Hartford, Conn.
Hodgman, S. A	P., W. & B. Rd	Wilmington, Del.
Haggett, J. C	D., A. V. & P. Rd.	Dunkirk, New York.
ano n , C. F.	D. & M. Rd	Detroit, Mich.
Hewitt, W. O	T., P. & W. Rd	Peoria, Ill.
Hull, A. S	C V. Rd	Chambersburg, Pa.
Johann, Jacob	W. & St. L. Rd.	Springfield, Ill.
Jackman, J. A.	C., A. & St. L. Rd	Bloomington, Ill.
	Illinois Central Rd	Chicago, Ill.

NAME.	ROAD.	ADDRESS.
Jacques, Richard	Capiopa Rd	Chili, S. A.
Johnson, J. B	A. C. Rd	Helena, Ark.
Johnson, F. W.	Sp., J. & P. Rd	Springfield, Ohio.
Kinsey, J. I,	L. V. Rd	Easton, Pa.
Keeler, Sanford	F. & P. M. Rd	East Saginaw, Mich.
Kilby, G. S.	C. & P. Rd	Lyndonville, Vt.
Kaufholz, F. G.	C., C., C. & I. Rd	Cleveland, Ohio.
King, Robert	W. & A. Rd	Montgomery, Ala.
Losey, Jacob	Steam Forge Co	New Albany, Ind.
Lauder, J. N.	Northern Railroad	Concord, N. H.
Leech, H. L.	Hinkley Locomotive Works	Boston, Mass.
Lingle, Thomas	Box 97	South Amboy, N. J.
Lannon, Wm	House of Representatives	Washington, D. C.
Lewis, W. H.	D., L. & W. Rd	Kingsland, Pa.
Lewis, W. H.	N. P. Rd	Brainerd, Minn.
Mulligan, John	Connecticut River Rd	Springfield, Mass.
Mitchell, A	W. Div. L. V. Rd	Wilkesbarre, Pa.
Morse, G. F.	Portland Locomotive Works.	Portland, Me.
Mead, Lyell T.	C., F. & W. Rd	Chippewa Falls, Wis.
Marten, John E	C., C. & T. Rd	Chili, S. A.
Maglenn, James	C. C. Rd	Laurinburg, N. C.
McKenzie, Jno.	K. P. Rd	Wyandotte, Kan.
McKenna, J.	I., P. & C. Rd	Peru, Ind.
McFarland, John	C. & O. Rd	Richmond, Va.
McCrum, J. S	M. R., Ft. S. & G. Rd	Kansas City, Mo.
McVey, John	A. & G. S. Rd	Chattanooga, Tenn.
McAlpine, A. R	Ind. Div. C., C., C. & I. Rd	Brightwood, Ind.
Miller, Wm. H.	Transfer & Stock Yard Co.	Indianapolis, Ind.
Noyes, Warren E.	E. Div. G. T. Rd	Gorham Sta., N. H.
Ortton, John.	C. S. Rd	St. Thomas, Canada.
Pendleton, M.	S. & R. Rd	Portsmouth, Va.
Perry, F. A	C. & A. Rd	Keene, N. H.
Perrin, P. J	Taunton Locomotive Works	Taunton, Mass.
Peddle, C. R.	T. H. & I. Rd	Terre Haute, Ind.
Philbrick, J. W	M. C. Rd	Waterville, Me.
Prescott, G. H.	P. C. & St. L. Rd.	Logansport, Ind.
Purves, T. B.	W. Div. B. & A. Rd	Greensburg, N. Y.
Place, T. W	Ill. Cent.	Waterloo, Iowa.
Pillsbury, Amos		Hartford, Conn.
Pilson, S. S.		Louisville, Ky.
Price, Thos.		Cincinnati, Ohio.

NAME.	ROAD.	ADDRESS.
Paterson, J. S.	C., I. & St. L. & C. Rd.	Cincinnati, Ohio.
Parry, Chas. T.	Baldwin Locomotive Works.	Philadelphia.
Ray, W. F.	T., W. & W. Rd.	Fort Wane, Ind.
Richards, George.	B. & P. Rd.	Boston, Mass.
Robb, W. D.	L., P. & S. M. Rd	Elizabethtown, Ky.
Rushton, William.	A. & W. P. Rd.	Atlanta, Ga.
Reynolds, G. W.	B., C., F. & N. B. Rd.	Taunton, Mass.
Robertson, Thomas.	M. P. & C. Rd.	Marietta, Ohio.
Sellers, Morris.	No. 6 Ashland Block.	Chicago, Ill.
Schaeffer, August.	L., C. & L. Rd.	Louisville, Ky.
Schlacks, Henry.	Illinois Central Rd.	Chicago, Ill.
Swift, John.	Schenectady Loco. Works.	Schenectady, N. Y.
Smith, W. T.	P. & E. Rd.	Erie, Pa.
Smith, Allison D.	Government Rd.	New Zealand.
Strode, James.	E. & C. Div. N. C. Rd.	Elmira, N. Y.
Stevens, G. W.	L. S. & M. S. Rd.	Elkhart, Ind.
Shaver, D. O.	Pennsylvania Rd	Pittsburgh, Pa.
Setchel, J. H.	L. M. Rd.	Cincinnati, O.
Sedgley, James.	L. S. & M. S. Rd.	Cleveland, O.
Sanborn, A. J.	I. & St. L. Rd	Mattoon, Ill.
Stearns, W. H.	Conn. Rd	Springfield, Mass.
Slingland, N.	Western Rd.	Hartford, Conn.
Sprague, H. N.	E. K. Porter & Co	Pittsburgh, Pa.
Salisbury, L. B.	St. L. & S. E. Rd.	Mt. Vernon, Ill.
Selby, W. H.	St. L., K. C. & N. Rd.	Moberly, Mo.
Sleppy, E.	S. J. & D. C. Rd.	St. Joseph, Mo.
Small, Robert B	I. & G. N. Rd.	Palestine, Texas.
Simonds, G. B.	C. & St. L. Rd.	East Carondelet, Ill.
Sitton, B. J	S., R. and D. Rd,	Selma, Ala.
Swanston, Wm.	J., M. & I. Rd.	Jeffersonville, Ind.
Spittle, W.	Valley Rd.	Cleveland, O.
Steel, W. J.	L., N. & Gt. S. Rd.	Nashville, Tenn.
Twombly, T. B.	C., R., I. & P. Rd.	Chicago, Ill.
Turreff, W. F.	C., T., V. & W. Rd.	Elyria, O.
Towne, H. A.	N. P. Rd.	Brainerd, Minn.
Taylor, J. K.	O., C. & N. Rd.	Boston, Mass.
Tull, C. H	V., S. & T. Rd.	Monroe, La.
Thumser, John.	O. & M. Rd.	Seymour, Ind.
Thomas, W. B.		
Underhill, A. B.	B. & A. Rd.	Boston, Mass.
Van Vechten, J.	N. Y., L. E. & W. Rd.	Susquehanna, Pa.

NAME.	ROAD.	ADDRESS.
Watrows, Geo. C.	D., L. & N.	Iona, Mich.
West, Geo. W.	S. C. & N. Y.	Syracuse, N. Y.
West, Thomas	N. Y., & L. E. & W. Rd.	Buffalo, N. Y.
Walsh, Thomas	N. & O. of L. & N. Rd.	Memphis, Tenn.
Warren, B	St. L., A. & T. H. Rd.	St. Louis, Mo.
Woods, H. E.	C., R., I. & P. Rd.	Rock Island, Ill.
Wells, Reuben	L. & N. Rd.	Louisville, Ky.
Wiggins, J. E.	H. E. & W. T. Rd.	Houston, Texas.
Waite, F. A.	B. & M.	Boston, Mass.
Woodcock, W.	Central R. R. of N. J.	Elizabethport, N. J.
White, J. L	E. & C. Rd.	Evansville, Ind.
Williams, E. H.	Baldwin Locomotive Works.	Philadelphia.
Weaver, D. L.	E. K. Rd.	Hunnewell, Ky.
White, Phillip.	C. & P. Rd.	Wellsville, O.
Wilder, F. M.	N. Y., L. E. & W. Rd.	Susquehanna, Pa.
Wightman, D. A.	Pittsburgh Locomotive Works.	Pittsburgh, Pa.
Young, L. S.	C., C., C. & I. Rd.	Cleveland, O.

ASSOCIATE MEMBERS.

NAME.		ADDRESS.
Bement, W. B.	Twenty-first and Callowhill st.	Philadelphia, Pa.
Dudley, P. H		Cleveland, O.
Evans, W. W.	66½ Pine street	New York City.
Forney, M. N	73 Broadway	New York City.
Holley, Alex. L.	273 Broadway	New York City.
Hill, John W		Cincinnati, O.
Lilly, J. O. D.		Indianapolis, Ind.
Miles, F. B		Philadelphia.
Morten, Henry	Professor Stevens' Institute.	Hoboken, N. Y.
Nott, Gordon H		Chicago, Ill.
Raymond, J. A		Chicago, Ill.
Sellers, Coleman		Philadelphia, Pa.
Smith, Chas. A.	Washington University	St. Louis, Mo.
Thurston, R. H.	Professor Stevens' Institute	Hoboken, N. J.
Wheelock, Jerome		Worcester, Mass.

HONORARY MEMBERS.

Dripps, Isaac	3405 Walnut Street	Philadelphia, Pa.
Robinson, W. A.		Hamilton, Can.

ORDER OF BUSINESS.

1. Reading the Minutes of previous meeting.
2. Calling the Roll of Members.
3. Signing the Constitution.
4. Report of Secretary.
5. Report of Treasurer.
6. Report of Committees appointed at a previous meeting.
7. Election of Officers.
8. Appointment of a Committee to suggest Subjects for Consideration.
9. Appointment of Miscellaneous Committees: On Finance, Printing and Place for Holding Next Annual Meeting.
10. Report of Committee to suggest Subjects for Consideration.
11. Appointment of Committees to report upon Subjects suggested for Consideration.
12. Unfinished Business.

J. N. LAUDER,
R. WELLS,
J. DAVIS BARNETT,
S. J. HAYES,
J. H. SETCHEL,
} *Committee.*

OBITUARY.

Mr. JOHN MINSHULL, a member of this Association and late Master Mechanic of the New York & Oswego Midland Railroad, at Middletown, New York, died August 19th, 1879.

Mr. Minshull was a native of England, coming to this country with his parents in 1857. At an early age he displayed a fondness for machinery, and in due time was regularly apprenticed in the Erie Railway shop at Susquehanna, Pennsylvania, in which place his parents had settled on coming to America.

During his apprenticeship he applied himself diligently to the task of acquiring an accurate and extensive knowledge of his chosen calling. During his leisure hours he read and studied for the purpose of supplying a deficiency in his education, which had of necessity been meager.

At the conclusion of his apprenticeship he traveled through the West, working at his trade in different places, thereby gaining an insight into the different methods of management, and at the same time adding to his fund of information by travel and contact with people.

Returning East, he found employment on the New York & Oswego Midland Railroad as a locomotive fireman. He subsequently and successively became a locomotive engineer, foreman of a repair shop, and Master Mechanic, which latter position he filled up to the time of his death with satisfaction to his superiors, evincing a good degree of executive ability, which, in one so young, promised well for future success. He was ambitious, energetic, and honest, and possessed of considerable inventive skill.

He was in his twenty-ninth year at the time of his death, and leaves a wife to mourn him, to whom he had been married but about two years. In his intercourse with his associates he was exceedingly affable, and had a large circle of friends.

As a member of this Association he was highly respected. While not taking an active part in the discussions, he was an attentive

listener, desiring rather to profit by the experience of others than to express his own views.

In the community where he resided he was held in high esteem, and the sad accident by which his life was lost caused sincere sorrow to all who were associated with him.

F. M. WILDER,
J. I. KINSEY,
JOHN C. ELLIS,
Memorial Committee.

Resolutions on the Death of J. B. Wilson.

To the American Railway Master Mechanics' Association:

WHEREAS: It has pleased God in His infinite wisdom to remove from us by death our friend and companion, and a member of this Association, J. B. WILSON; therefore, be it

Resolved, That in his decease we recognize the hand of Him who doeth all things well. By his death we lose an esteemed friend and the Association a respected and useful member.

Resolved, That we tender to the family of deceased our heartfelt sympathy in this their great bereavement, and trust that an all-wise Creator, in His infinite mercy, will comfort and console them.

Resolved, That a copy of these resolutions be forwarded to wife of deceased, and that they be also inserted in the Proceedings of our Annual Meeting.

J. B. WILSON, late Master Mechanic of the Ohio and Mississippi Railroad, served first as machinist in the company's shops. His abilities and talents early marked him out among his companions, and his advancement was rapid to foreman, and next to Master Mechanic, a position he filled with credit to himself and satisfaction to the company until his decease.

A. SCHAEFFER,
J. S. PATERSON,
JAS. ECKFORD,
Committee.

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